SCIENCE

FRIDAY, AUGUST 21, 1914

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THE AIMS AND OBJECTS OF THE SOCIETY OF THE SIGMA XI[1]

IT is provided in the constitution of the Society of the Sigma Xi that the president shall explain the aims and objects of the society to the members-elect. In the form of initiation prescribed in the constitution for all the chapters of this honorary scientific society this part of the program precedes the reading of the formal pledge, which is as follows:

> Do you hereby pledge yourself to uphold the principles of the Society of the Sigma Xi, and assume the responsibilities incumbent upon active membership therein?

The Constitution states that:

> The object of this society shall be to encourage original investigation in science, pure and applied, by meeting for the discussion of scientific subjects; by the publication of such scientific matter as may be deemed desirable; by establishing fraternal relations among investigators in the scientific centers; and by granting the privilege of membership to such students as have, during their college course, given special promise of future achievement.

Its motto is

> Companions in zealous research.

This pledge has been read, to which later you will be asked if you assent, and also the section from the constitution defining the object of this society, which later you will be asked to sign, in order that you may have both of them in mind during the following remarks.

The constitution does not prescribe the form in which the "aims and objects of the Society" shall be explained to the members-elect, but leaves to the president great latitude as regards these matters. What I

[1] President's address to the Omega Chapter (Ohio State University), May 21, 1914.

have to say this evening is not, therefore, to be accepted without question as the authoritative policy of this society; but rather as my personal opinion based upon observation during its entire history and a fairly intimate acquaintance with its foundation.

Most of you are probably aware that it was organized at Cornell University and that chapter is known as the Alpha. At least as early as 1883 Professor Henry S. Williams, of Cornell, was thinking about the organization of a society which should recognize in some way the attainment of students in science as Phi Beta Kappa did in literary lines. During commencement week of June, 1886, there was organized the Society of Cornell University Geologists by Professor Williams; but its scope was not broad enough to satisfy him and later he drew up a preamble for a national scientific organization which was named the Society of Modern Scientists. One paragraph of the preamble stated that

> Therefore we believe it is highly desirable to encourage high attainments among the future students of Cornell University and other kindred institutions by recognizing by some mark of honor those who exhibit special ability in investigating, understanding and interpreting the facts of nature in the various branches of modern science.

Independently, shortly before the Cornell Commencement of 1886 two engineers, William A. Day and Frank Van Vleck, planned the formation of an honorary scientific society. The following fall they associated with themselves seven other engineers and began work on the formal organization of such a society, for which they selected the name Sigma Xi. The preamble of the first printed constitution stated that they were "forming a brotherhood in Science and Engineering." The membership and its activities, however, supported the conclusion reached by many in contact with it that this was strictly an engineering society. Some time that fall Professor Williams learned of this movement when he attempted to interest the engineers in the formation of a general society to select men in the same way for membership from those departments of applied science that he was advocating for the departments of pure science. Suffice it to say, without relating all the details, that the two movements joined forces, and the formal organization of Sigma Xi was accepted as the working nucleus of a university honorary scientific society. The minutes of the second meeting of Sigma Xi state that the proposals of Professor Williams were accepted, and at the fourth meeting he was nominated for a member of the society and unanimously elected. This was in the fall of 1886 and made the charter membership of the society ten. At the next meeting four additional members of the faculty and five graduate students were elected to membership, so that twenty-seven years have passed since the first members, similar to those we have now met to initiate, were received into this society. During these years it has attained an honored position in the university world, as well as entrance to most of the institutions of learning in this country in which science is strong, so that there are now twenty-eight chapters with a total membership of 7,498, as recorded in the "Quarter Century Record History of Sigma Xi." So much for the history of this society to which you have been elected members.

Its aims may be explained in part by some account of the spirit of the institution in which it was born. In any list of the ultimate causes which led to the organization of Sigma Xi should be ranked very high the influence of Andrew Dixon White, the first president of Cornell University. A scholar, an author of renown, a diplomat, statesman, university professor and president, he certainly ranks among the few

really great university presidents this country has had. He was a member of the famous class of '53 of Yale, where he was elected a member of the honorary societies of Phi Beta Kappa and Skull and Bones, next a student at French and German universities and attaché at the St. Petersburg legation, then returned to this country and served for six years as professor of history and English literature in the University of Michigan. For four years he was a member of the New York State Senate, where in association with another senator—Ezra Cornell—he drafted the law which was passed creating Cornell University. Nominated by Mr. Cornell for president of the new institution and unanimously elected against his wishes by the other members of the board of trustees, Mr. White came to the presidency of Cornell University in 1867 at the age of thirty-five, familiar with the best in education both in this country and in Europe. This position he held with honor until 1885, and it is to be noted that the following year the two movements looking toward an honorary scientific society took definite form.

Three things stand out conspicuously in President White's administration which in my judgment are largely responsible for the spirit at Cornell which led to the organization of Sigma Xi.

In the first place, although himself a graduate of a leading classical college, he organized a university in the East where the scientific departments, both pure and applied, had the same dignity and in all respects equal rank with the departments of the humanities.

Secondly, he called to this faculty in nearly every case men of ability who either then were or became distinguished in their several fields of learning. As the speaker looks back upon his student days at Cornell he realizes that, with one or two exceptions, all his teachers were men who have attained positions of honorable distinction. They were men that measured up to the standard set by President Jordan when he wrote that

> it is true that no second-hand man ever was a great teacher. I very much doubt if any really great investigator was ever a poor teacher. How could he be? The very presence of Asa Gray was an inspiration to students in botany for years after he had left the class room. Such a man leaves the stamp of his greatness on every student who comes within the range of his influence.[2]

Sylvester, the great mathematician of Johns Hopkins University, in his Commemoration Day address is reported to have made the following statements:

> I hesitate not to say that, in my opinion, the two functions of teaching and working in science should never be divorced.
>
> I believe that none are so well fitted to impart knowledge as those who are engaged in reviewing its methods and extending its boundaries.[3]

Thirdly, President White took a personal interest in the development of the various departments and particularly in the research work of the faculty. I shall always remember his coming into the geological laboratory one afternoon with President Gilman, of Johns Hopkins University, to look at a collection of Trenton Trilobites which the university had recently purchased. Those two distinguished university presidents spent at least half an hour with Professor Henry S. Williams in looking at and discussing those fossils from the old Paleozoic rocks of New York. A scholar and distinguished investigator himself in his chosen field, he kept up his research work during all those early strenuous years of the university's life, and no one who was engaged in research work along any line received more cordial en-

[2] *Popular Science Monthly*, Vol. LXIV., 1904, p. 313.

[3] SCIENCE, N. S., Vol. I., February 22, 1895, p. 206.

couragement and recognition from any one than from President White. He had selected the faculty with care, and although he might not fully understand an investigation, he had confidence that the professor would attain creditable results and he gave him and his work most cordial support. Neither did he wait before giving such encouragement until the work had been published and favorably received; but not infrequently a professor received a spoken or written word of encouragement when without such encouragement perhaps it would have been abandoned. It is true that in those days the number of instructors in Cornell University was small, and likewise the number of students; but, after all, there was more of a true university atmosphere in the institution than is to be found in some of the present day which have almost as many thousand students as Cornell had hundreds in those old days.

In such an environment it was only natural after the organization of a chapter of Phi Beta Kappa in 1881, to which at that time in Cornell only those students who had training in at least one of the classical languages were eligible, that the scientific side of the university, which in every other way was on an equal footing with the literary side, should consider the formation of an honorary scientific society.

One of the objects of the Sigma Xi Society, as they were enumerated in its first published constitution, was:

> To supplement the regular course of instruction in science by original investigation.[4]

The speaker regrets that this sentence has been dropped from the constitution, which he believes reflected the spirit of Cornell University during the period of the conception and birth of this Society. Neither is it believed that this spirit has passed away, for in an address last fall by one of her distinguished linguistic scholars, Professor Schmidt, he said:

> Numbers alone do not make a great university. . . . Three indispensable factors in making a great university are: (1) competent investigators capable of increasing the world's knowledge; (2) distinguished teachers able to impart the most advanced knowledge, and (3) students eager for knowledge and passionately pursuing it.[5]

Professor Ward, of the University of Illinois, and corresponding secretary of the Society of the Sigma Xi, has also spoken, in a recent address, very emphatically concerning the importance of investigation for teachers. He said:

> Whatever private institutions may do, the state has no choice. The men who are its teachers must also be investigators and must contribute their share to the extension of knowledge.[6]

No less certain, however, were the words of Dr. Mendenhall on this campus last summer—the most distinguished living member of this university's early faculty—when he said:

> The university must also recognize, and in a generous way, its obligation to do its share in enlarging the boundaries of human knowledge. . . .
>
> During the last hundred years the relation of man to his environment has changed more than in all the past centuries of his history considered as one and this almost incredible material revolution is entirely the outcome of *applied* science. If there is to be no halt in this grand march there must be continued scientific *discovery*, the absolutely indispensable forerunner of the *application* of science. In original research, therefore, the "discovery of truth," the university of the state must, in the future, assume leadership, and let us hope that our own institution may always be found in the front rank.[7]

The principal object of this society is not, as many suppose, to confer an honor upon students of marked ability. It is an

[4] *Sigma Xi* [1887], p. 4.

[5] *Cornell Alumni News*, Vol. XVI., November 27, 1913, p. 106.

[6] Science, N. S., Vol. XXXVIII., December 12, 1913, p. 838.

[7] *Ohio State University Monthly*, November, 1913, p. 18.

honor, however, to be elected to membership in it, and one which the speaker would not attempt to minimize. In fact, he believes it would be worthy of support in this commercial age if it did nothing further than recognize those students who by the excellence of their standing in science have demonstrated that throughout their college or university course they have devoted their time to the things for which our higher institutions of learning were founded instead of to the many and various outside interests that now hinder and at times appear seriously to handicap the efforts of our large universities to give thorough scholastic training. He believes it fully worth the while of Phi Beta Kappa to recognize publicly those students that stand first in scholarly rank in their class, even if it did nothing else. It is said that this is undemocratic; but this democracy, as has often been pointed out by our European critics, is one of the dangers of American universities. One of these friendly students of American tendencies is Professor Marcks, the historian and Leipzig University professor, who after a recent sojourn in this country is reported as follows concerning the democratic idealism present in the American university as well as in the general life of the country. Its achievements are unmistakable. But, he asks, is there not this danger: that its aim can not very well rise above a highly respectable mediocrity? Does this practical system provide for the development of the rare personality, of the unusually gifted, of the intellectual aristocrat?[8]

There is no greater fallacy than the idea that all men are born equal, so far as mental ability is concerned. This fact appears to have been frequently lost sight of during recent years in the efforts to secure large numbers of students by those responsible for the administration of our universities. Professor Ward, of our own society, in a recent address has made a vigorous protest against this tendency to deterioration in our American universities. Among other things he says that:

In the mad rush after students, all of our institutions alike have added to their own weakness rather than to their own vigor, and have wasted the resources of the people insofar as they have taken part in the struggle after mere bigness.[9]

Or as Dr. Mendenhall said at the fortieth anniversary of our own university:

The efficiency of many colleges and universities is greatly impaired by the presence of large numbers of students quite unequal to the tasks they are supposed to perform.[10]

The real problem, as the speaker sees it, is whether the leaven of Sigma Xi and Phi Beta Kappa is sufficient to leaven the ever-increasing numbers of students that are entering our universities, a considerable proportion of whom are indifferent and poorly prepared.

The speaker would say that the encouragement of scientific scholarship is one of the objects of this society. The presidential address at the inauguration of the Alpha Chapter, on June 15, 1887, was entitled "The Ideal Modern Scholarship." Near the conclusion of this address Professor Williams stated that

I find, then, three essentials to the ideal modern scholar of America:

In learning he must master the elements of the current knowledge of the day; this is contemplated in the full scientific education of our universities.

In means of communication, he must have acquired a thorough familiarity with his own language as a vehicle of thought. . . . Besides English, he must be able to use German and French; with these he can reach the civilized world.

Thirdly, he must be a specialist, which means that he must take his place among the workers of

[8] *Cornell Alumni News*, Vol. XVI., October 30, 1913, p. 59.

[9] SCIENCE, N. S., Vol. XXXVIII., December 12, 1913, p. 834.

[10] *Ohio State University Monthly*, Vol. 5, November, 1913, p. 18.

the world, and fill that place. In his specialty he must think for himself, plan for himself, act for himself. Here he must rest on no one, but be himself a support for others.[11]

The question may be asked, what is scholarship? According to Professor F. C. Brown, of the State University of Iowa, the answer is: The discovering, the organizing and the explaining of new facts. Only the uninformed and unscholarly are in the habit of designating the mere diffusion of knowledge as scholarship.[12]

Further on in this address on "The Predicament of Scholarship in America" Dr. Brown discusses its "situation in our universities" and states that

they believe in general that productive scholarship is the most important function of a university and it is agreed that genuine scholars are of the most rare and difficult type to develop. But the difficulty with our universities is one that arises from mixed ideals, particularly in our state universities. The ideal of competition perhaps takes precedence of all other ideals in practise, and along with this is associated the ideal of efficiency in detail management of students. Surely a university wants scholars, but it wants a large number of students first. It wants more students in order to convince the people of its greatness, so that it may get more money so that it may establish more departments and so get more students, and so on. It must do extension work so that the work of scholars may reach every citizen of the land within a few days after it has been accomplished. Energy and resources that might be directed toward scholarship are scattered in every direction that human imagination can conceive of. The ideal in practise is not how great scholarship, but how thin it can be spread. In other words, there is in our scholarship a strong tendency toward democracy gone mad.[13]

Or, as Professor George J. Pierce, of Stanford University, says:

The wholesale business of the state universities limits if it does not prohibit that attention to the exceptional student which may result in training a leader of his generation, a seer who, divining the future needs of the state, may begin to prepare to meet them, a man who, profiting by the recorded experience of the past, may mold as well as meet conditions.[14]

The principal reason for your election to this society, as the speaker sees it, however, is that you have either made some contribution to science or that you give promise of being able to perform such service. This idea was so clearly expressed by Professor Titchener in his initiation address at Cornell some fourteen years ago that I can not refrain from quoting his remarks addressed personally to the members-elect of that chapter. He said:

Some of you are taken from the instructing staff of the university. You, Instructors, we welcome as proved men, tried servants of science, our common mistress. Many of you are drawn from the ranks of the graduate students. You, Graduates, we welcome, because you have paused now, at the outset of your career, to do something for the furtherance of human knowledge; and—what I think is more important even than that—because you have paused to prepare yourselves to carry the message of science into all those various spheres of activity to which you shall presently be called. Many of you, again, are undergraduates. You, Undergraduates, we welcome—not because you have done good work in your courses; anybody can do good work in his courses—but because we think we discern in you some promise of ability to perform scientific work, and some promise of good will to realize that ability. Weigh that well, you who are to form the youngest generation of this society of the Sigma Xi; do not think lightly of it, or of the men whose opinion it now is. . . . Remember now that there is not one of us, by whose voice you are sitting here before me to-night, who has not worked hard and worked successfully to swell the total of human knowledge and of human achievement.[15]

Therefore, young ladies and young gentlemen, you see that this chapter of Sigma Xi in electing you to its membership believes you have the ability and purpose to serve your generation in the dis-

[11] Professor Henry S. Williams, "The Ideal Modern Scholarship," 1887, pp. 7, 8.

[12] Science, N. S., Vol. XXXIX., April 24, 1914, p. 587.

[13] *Ibid.*, p. 589.

[14] *Ibid.*, p. 590.

[15] President's address to the Cornell Chapter of the Society of the Sigma Xi, June 9, 1900, pp. 14, 15.

covery and advancement of scientific knowledge, and by accepting such membership you promise, so far as lies within your power, to carry out this purpose. You will note, therefore, that membership in this society, providing one lives up to the trust imposed on him, carries with it certain responsibilities which, like the marriage vows, are not to be lightly assumed. It means, perhaps, in the first place that you are not to make the getting of money the foremost object of your life work. Now this fact alone to an American in this commercial age is a matter of grave importance and one that eliminates from our membership most of those who are actively engaged in "business, with its self-seeking and bargaining" in contrast to those in "the world of science, with its self-renunciation and mutual confidence." This is what Professor Titchener calls the "vow of honorable poverty" and the first one that a scientific man must take. The second vow is that of hard work, which is likewise not an easy one, since the natural inclination of most men is not toward strenuous exertion when it is not called for by the necessities of life. There is no use in trying to ignore the fact that in almost all cases the discovery of new facts requires hard and exhausting work for which in general there is no pecuniary reward that ranks at all with what would be secured if the same amount of energy were put forth in the commercial or professional world. And this fact again eliminates from the ranks of the real scientific workers the large majority of even college and university trained young men and women. Finally, Professor Titchener sets a third vow for the man of science, and that is isolation, which is perhaps after all, the most difficult one. As he said,

> The life of the man of science must be a lonely life. It is not only that we have, most of us, to do our scientific work, as Helmholtz said, in our spare time, so that we have little leisure for the amenities of the social life around us. That is something, truly; but there is more than that. If we are to carry science beyond her present bounds, in any field of work, we must specialize. And that means that we shall hardly find, away from university centers, even one or two of our acquaintances who are in intelligent sympathy with us; we must work alone. Even within a university, the number of men who thoroughly understand and appreciate their neighbor's work must be very small.[16]

In these days of university distractions it is difficult for even the men of most ability in the university circle to keep their leisure time for research instead of giving it to the multitudinous activities that beckon them away from such stern and severe work.

You are thinking, undoubtedly, that few and perhaps none of the members of Sigma Xi come up to this standard. It is granted at once, for this difference between the claims and the realities of the society has long been recognized. It is, however, the *ideal* toward which the society aims, and few human organizations come up to the full measure of the vision of their leaders. It is very true that you can find plenty of members of this society who have not apparently justified their election; but it is really after all a tribute to its standing that they wish to become and remain members. Probably for one reason or another, some good and others not, not even all of you who are present to-night for the purpose of initiation will in any considerable degree attain to the ideals that have been formulated for this organization. This mixed active and inactive membership of the society for a long time disturbed the speaker, as it has various others who are keenly interested in the high aims of Sigma Xi. In later years, however, he has come to consider that it is probably inevitable to a

[16] *Ibid.*, pp. 10–13, for the remarks concerning the vows of a scientific man.

considerable degree. If the active members of the chapters have a fairly clear appreciation of the meaning of the society and are conscientious in nomination and election of members, that is probably about all that can be expected. As the world in which we live to-day exists, the clever manipulator, the politician, or the man of unlimited assurance frequently fills the position of importance rather than the man of merit. Some will know the difference, but probably with the mass of people the man who has a big amount of assurance will very frequently be able to pass the counterfeit as the genuine. It is believed, however, that we ought not to be unduly discouraged by this fact, or that we should in any measure lower the standards and ideals of Sigma Xi. Even in the Church of God the saint and sinner, the genuine and the hypocrite, are associated. You will remember in the parable of the wheat and the tares that the householder commanded the servants not to attempt to separate the tares from the wheat "lest while ye gather up the tares, ye root up also the wheat with them." So in our own society it is believed that you are called to a great work, to help increase the sum of human knowledge, and one that calls for the best efforts that you can put forth. It is believed that this is a personal call to each one of you, so far as it may be possible to consecrate whatever God-given talent you possess to some earnest work toward the increase and dissemination of knowledge. It is also believed that you need not be specially concerned whether at present you can see any practical results from such discovery or not. Find the new truth, and neither you nor perhaps any one can foresee what may be its importance in the future. So do not be overanxious as to whether your research has an immediate pecuniary reward in sight. Remember that Louis Agassiz, the greatest zoologist that America has had, said that he did not have time to make money. His regular efforts brought him, however, a comfortable living and a name that will last far longer than that of most of our American multimillionaires. So my counsel to you is that this is largely a personal matter and that your main efforts are to be devoted to producing the best of which you are capable, rather than watching and criticizing the efforts or non-efforts of others. If you earnestly and faithfully attempt to live up to the pledge of this society you will have a clear conscience yourself and in the final estimate of results it is believed you will be classed with the wheat and separated from the tares.

Finally, it is my duty to read to you the pledge of the Society of the Sigma Xi, to which you are asked to assent as your names are called. There is perhaps an appropriateness in the fact that one who was a member of the first list of novitiates of the Alpha Chapter is to put this pledge to you, the youngest members of the Omega Chapter. The pledge is, "Do you hereby pledge yourself to uphold the principles of the Society of the Sigma Xi, and assume the responsibilities incumbent upon active membership therein?"

Charles S. Prosser
Ohio State University

Doctorates Conferred by American Universities

The tables here published for the seventeenth year on the doctorates of philosophy conferred by American universities show that the number of degrees this year for the first time exceeded 500, being an increase of 31 over 1913, but of only 18 over 1912. Two hundred and forty-one of the 502 degrees were in the natural and exact sciences, which is about the same proportion as for all the years covered by these sta-

TABLE I

Doctorates Conferred

	Average of 10 Years, 1898–1907	1908	1909	1910	1911	1912	1913	1914	Total for 17 Years, 1898–1914
Columbia	32.2	55	59	44	75	81	66	63	765
Chicago	35.6	54	38	42	55	57	46	61	709
Harvard	33.8	42	38	35	42	41	52	63	651
Yale	31.8	32	44	27	31	31	39	32	554
Johns Hopkins	30.5	28	27	23	28	32	32	30	505
Pennsylvania	22.5	32	29	26	29	34	31	18	424
Cornell	18.1	22	34	35	34	33	35	47	421
Wisconsin	8.6	17	16	18	23	27	19	31	237
Clark	8.7	11	9	14	16	6	16	9	168
New York	6.7	15	13	11	17	10	16	19	168
Michigan	6.9	4	13	7	6	11	15	7	132
Boston	4.4	11	13	6	13	8	9	5	109
Illinois	.5	5	4	12	11	20	20	22	99
Princeton	2.6	6	4	8	9	12	13	21	99
California	3.3	4	10	6	6	15	10	14	98
Bryn Mawr	2.1	4	2	5	5	9	3	7	56
George Wash.	2.8	3	4	4	5	2	2	5	53
Virginia	2.8	4	1	4	2	4	4	3	50
Brown	2.3	2	5	1	4	6	1	5	47
Minnesota	2.4	3	5	1	2	2	3	3	43
Stanford	1.4	2	3	5	4	4	5	5	42
Catholic	2.0	1	3	3	5	5	3	1	41
Iowa	1.1	2	0	4	3	7	3	4	34
Nebraska	2.0	2	2	1	0	3	2	3	33
Radcliffe	.6	1	2	4	0	2	6	2	23
Mass. Inst.	.3	3	0	3	2	6	1	2	20
Cincinnati	.3	0	2	2	5	3	2	2	19
Indiana	.0	3	3	0	2	4	3	4	19
Ohio	.4	0	2	0	2	5	1	2	16
Missouri	.4	3	0	2	2	1	1	2	15
Pittsburgh	.1	4	0	2	1	1	5	1	15
Washington	.7	1	0	0	2	1	3	1	15
Vanderbilt	.6	1	1	2	0	1	2	0	13
Georgetown	1.0	0	0	0	0	0	0	1	11
Colorado	.5	0	1	0	0	0	1	2	9
N. Carolina	.5	0	1	0	0	0	0	3	9
Syracuse	.2	0	2	1	2	0	0	2	9
Kansas	.3	0	0	3	1	0	0	0	7
Northwestern	.4	0	1	0	1	0	0	0	6
Tufts	.5	0	0	1	0	0	0	0	6
Wash. and Lee	.4	1	0	0	0	0	0	0	5
Lafayette	.3	0	0	0	0	0	0	0	3
Dartmouth	.1	1	0	0	0	0	0	0	2
Lehigh	.2	0	0	0	0	0	0	0	2
Tulane	.1	0	0	0	0	0	1	0	2
Total	273.0	379	391	362	445	484	471	502	5,764

tistics, during which 2,786 degrees have been conferred in the natural and exact sciences and 2,978 in the other university subjects. For several years the number of degrees in the sciences was increasing the more rapidly, but this does not hold for the past two years, the number of degrees in the sciences being about the same as in 1911, and considerably smaller than in 1912. Harvard, Columbia and Chicago

TABLE II

Doctorates Conferred in the Sciences

	Average of 10 Years, 1898–1907	1908	1909	1910	1911	1912	1913	1914	Total for 17 Years, 1898–1914	Per Cent.
Chicago	16.4	37	20	24	35	37	16	28	361	51
Columbia	13.4	21	23	11	29	36	27	21	302	39
John Hopk.	16.8	17	20	15	19	23	21	18	301	60
Cornell	10.4	15	24	27	27	28	30	36	291	69
Harvard	14.1	13	14	10	20	15	22	28	263	40
Yale	12.4	16	27	12	15	21	19	13	247	45
Penna.	9.0	18	13	12	10	9	9	5	166	39
Clark	7.7	11	8	14	16	6	13	7	152	90
Wisconsin	2.8	6	4	13	13	14	5	17	100	42
California	2.4	2	6	4	5	12	9	11	73	74
Illinois	.3	0	2	9	6	15	11	18	64	65
Michigan	2.8	1	5	1	3	8	10	5	61	46
Princeton	1.1	3	3	2	5	7	7	7	45	45
Geo. Wash.	1.7	2	2	3	4	2	1	2	33	62
Stanford	1.1	2	2	1	4	3	5	2	30	71
Brown	1.2	2	2	1	3	4	1	4	29	62
Mass. Inst.	.3	3	0	3	2	6	1	2	20	100
Minnesota	.7	1	2	1	2	2	2	3	20	47
Nebraska	1.3	1	2	1	0	0	2	1	20	61
Virginia	1.1	2	0	1	1	2	2	1	20	40
Bryn Mawr	1.0	1	0	2	1	3	0	2	19	34
New York	.6	1	3	2	1	2	3	1	19	11
Iowa	.7	0	0	2	1	3	2	2	17	50
Indiana	.0	3	3	0	2	4	1	2	15	79
Wash.	.7	1	0	0	2	1	3	1	15	100
Ohio	.4	0	2	0	2	5	0	0	13	81
Cincinnati	.1	0	1	1	4	1	2	2	12	63
Missouri	.3	2	0	2	2	0	1	1	11	73
Catholic	.5	—	2	0	1	1	0	0	9	22
Pittsburgh	.0	0	0	1	1	1	5	0	8	53
Kansas	.3	0	0	3	1	0	0	0	7	100
Vanderbilt	.3	1	1	0	0	1	1	0	7	54
Boston	.1	0	1	0	0	1	2	0	5	5
N. Carolina	.3	0	1	0	0	0	0	1	5	56
Tufts	.5	0	0	0	0	0	0	0	5	83
Northwest.	.2	0	1	0	1	0	0	0	4	67
Wash. & Lee	.3	1	0	0	0	0	0	0	4	80
Syracuse	.1	0	0	1	1	0	0	0	3	33
Colorado	.2	0	0	0	0	0	0	0	2	22
Dartmouth	.1	1	0	0	0	0	0	0	2	100
Lehigh	.2	0	0	0	0	0	0	0	2	100
Georgetown	.1	0	0	0	0	0	0	0	1	9
Lafayette	.1	0	0	0	0	0	0	0	1	33
Radcliffe	.0	0	0	1	0	0	0	0	1	4
Tulane	.0	0	0	0	0	0	1	0	1	50
Total	124.1	184	194	180	239	273	234	241	2,786	48

conferred this year about the same number of degrees and about twice as many as Yale and Johns Hopkins. These two latter uni-

versities are not maintaining the position they held from 1898 to 1907. Cornell, Wisconsin, Illinois and Princeton conferred this year more degrees than ever before, the advance of the last two institutions being remarkable. Princeton conferred this year nearly as many degrees as during the ten years from 1898 to 1907, and Illinois conferred over four times as many degrees as during that period. Clark and Michigan, like Yale and the Johns Hopkins, maintained only about the place they held ten years ago. The number of degrees conferred by Harvard is larger than it has ever been, while there is a decrease at Columbia compared with the past three years.

TABLE III

Doctorates Distributed According to Subjects

	Average of 10 Years, 1898–1907	1908	1909	1910	1911	1912	1913	1914	Total
Chemistry	32.3	54	43	48	68	78	68	71	753
Physics	15.5	22	25	25	33	30	22	23	335
Zoology	15.2	25	18	25	25	20	26	25	316
Psychology	13.5	23	21	20	23	29	24	12	287
Botany	12.6	11	16	10	20	30	28	34	275
Mathematics	12.1	23	14	23	25	22	21	25	274
Geology	7.1	5	13	10	15	23	14	13	164
Physiology	4.1	7	13	4	2	12	2	8	89
Astronomy	3.4	1	7	3	4	2	11	2	64
Agriculture	1.0	2	7	4	11	11	8	9	62
Bacteriology	1.4	1	5	1	4	6	3	6	40
Anthropology	1.0	4	4	2	2	0	3	2	27
Anatomy	.9	2	0	1	1	6	1	2	22
Paleontology	1.6	1	0	2	0	0	0	4	23
Pathology	.5	2	3	1	1	2	2	1	17
Engineering	.8	0	0	1	2	2	0	4	17
Mineralogy	.6	0	3	0	1	0	0	0	10
Metallurgy	.3	0	1	0	1	0	0	0	5
Geography	.1	1	1	0	1	0	1	0	5
Meteorology	.1	0	0	0	0	0	0	0	1
Total	124.1	184	194	180	239	273	234	241	2,786
English		30	28	32	35	32	42	42	241
History		32	22	25	28	20	26	36	189
Economics		17	42	7	17	26	16	27	152
Philosophy		25	15	20	26	15	22	19	142
Education		6	9	13	23	21	25	27	124
German		14	14	16	8	15	23	23	113
Latin		13	12	16	13	17	19	16	106
Sociology		6	6	14	18	12	11	22	89
Romance		12	16	6	12	15	9	15	85
Greek		13	11	5	7	5	8	10	59
Political Science		9	4	9	6	9	15	7	59
Oriental		9	15	11	1	10	8	2	56
Theology		7	2	1	7	7	6	8	38
Philol. and Com. Lit.		0	1	5	1	2	4	2	15
Law		1	0	1	2	1	1	3	9
Classical Arch		0	0	0	1	3	1	1	6
Fine Arts		0	0	0	0	1	1	1	3
Music		1	0	1	1	0	0	0	3
Total		195	197	182	206	211	237	261	1,489

Turning to the table referring to the degrees conferred in the sciences, we find that Chicago maintains its lead, though it was this year equalled by Harvard and surpassed by Cornell. Columbia takes the place of the Johns Hopkins University as the university having conferred the most degrees in the sciences next to Chicago, while Cornell follows very closely. In the separate sciences, chemistry, as always, is in the lead, with 71 degrees, followed by botany, with 34 degrees. The increase in the number of degrees in botany is noteworthy, it being nearly three times the average from 1898 to 1907. There were also conferred this year 9 degrees in agriculture and 6 in bacteriology. In both zoology and in mathematics 25 degrees were conferred. In subjects other than the natural sciences, English and history lead, surpassing any of the sciences except chemistry. Next in order come economics and education, each with 27 degrees, followed by German with 23 degrees and sociology with 22 degrees.

The institutions which conferred two or more degrees in a science are: *chemistry*, Harvard, 9; Cornell, 8; Columbia and Yale, 7 each; Illinois, 6; Johns Hopkins and Wisconsin, 5 each; Chicago, 4; California and Clark, 3 each; Massachusetts Institute of Technology and Stanford, 2 each; in *physics*, Cornell, 5; Johns Hopkins, 4; Wisconsin, 3; Chicago and Illinois, 2 each; in *zoology*, Cornell and Harvard, 4 each; California, Columbia, Illinois and Johns Hopkins, 3 each; in *psychology*, Chicago, 4; Clark and Cornell, 2 each; in *mathe-*

matics, Johns Hopkins, 5; Chicago, 4; Princeton, 3; Cornell, Harvard and Illinois, 2 each; in *botany,* Chicago, 10; Cornell, 7; Wisconsin, 6; Harvard, 3; Columbia and Illinois, 2 each; in *geology,* Harvard and Yale, 3 each; Chicago, Columbia and Princeton, 2 each; in *physiology,* Columbia, 2; in *agriculture,* Cornell, 4; Wisconsin, 2; in *bacterioloy,* Brown, 3; in *paleontology,* California and Chicago, 2 each; in *engineering,* Illinois, 2.

The names of those on whom the degree was conferred in the natural and exact sciences, with the subjects of their theses, are as follows:

CORNELL UNIVERSITY

Paul Johnson Anderson: The Morphology and Life History of the Chestnut Blight Fungus.

Jacob A. Badertscher: The Morphogenesis and Histogenesis of the Thymus of the Pig (*Sus scrofa*).

Harris Miller Benedict: Senile Changes in Leaves of *Vitis Vulpina* L. and certain other Plants.

Earl Whitney Benjamin: A Study of the Variation and Inheritance of the Size, Shape and Color of Eggs.

Charles Clarence Bidwell: A Comparison of Actual and Black Body Temperatures.

Forest Milo Blodgett: Perithecial Development of *Sphærotheca humuli.*

Edwin Garrigues Boring: The Sensations of the Alimentary Canal.

Thomas Roland Briggs: The Electrochemical Production of Colloidal Copper.

Jean Broadhurst: A Study of the Habitats and the Morphological and Physiological Characters of Streptococci.

Oliver Ellsworth Buckley: The Hall Effect and Allied Phenomena in Silicon.

Robert Wilbur Burgess: The Uniform Motion of a Sphere through a Viscous Liquid.

Wheeler Pedlar Davey: The Factors which Determine the Quantity of Röntgen Radiation given off by an X-ray Tube.

Jehiel Davidson: A Comparative Study of the Effect of Cumarin and Vanilin on Wheat Grown in Soil, Sand and Water Cultures.

Roland Parker Davis: Foundations for Bridges and Buildings.

Albert Watson Davison: Electrolytic Deposition of Brass on a Rotating Cathode.

John Frederic Howard Douglas: The Reluctance of Some Irregular Magnetic Fields.

Gail J. Fink: The *P, T, X* Diagrams of the Systems Ammonium Chloride-Ammonia, and Copper Sulphate-Ammonia.

Howard Brett Frost: The Relation of Temperature to Variation in Matthiola.

Mabel Ensworth Goudge: On Certain Tactual Illusions.

Charles Truman Gregory: The Downy Mildew Disease of Grapes.

Edward Sewall Guthrie: The Metallic Flavor in Dairy Products.

Lexemuel Ray Hesler: Black-rot, Leaf-spot and Canker of Pomaceous Fruits.

Robert Andrew Jehle: Brown Rot of Orchard Fruits.

Alfred Erwin Livingston: The Effect of Castration on the Weight of the Pituitary Body and other Glands of Internal Secretion in the Rabbit.

Edwin Charles Mayer: The Diffusion of Gases through the Walls of Glass and Quartz Tubes.

Emmeline Moore: Potamogetons in relation to Pond Culture.

Jay Arthur Myers: Studies on the Syrinx of *Gallus domesticus.*

William Howard Rankin: Field Studies on the Endothia Canker of Chestnut in New York State.

Fred Hoffmann Rhodes: The Fractional Crystallization of the Picrates of the Rare Earths of the Didymium Group.

Frank Elmore Rice: Studies on the Action of Erepsin.

Harold Eaton Riegger: Hydronitric Acid and Hydrazine Trinitride.

Clarence McKinlay Sherwood: A Study of Stokes' Neutral Red Reaction as Applied to the Sanitary Examination of Water.

Lucy Wright Smith: Studies of North American Plecoptera (*Pteronaricinæ* and *Perlodini*).

Ruby Green Smith: The Evolution of the Venation in the Anal Area of the Wings of Insects.

Anna Helen Tappan: Plane Sextic Curves Invariant under Birational Transformations.

Harry Boyer Weiser: Flame Reactions.

UNIVERSITY OF CHICAGO

Edwina Eunice Abbott: On the Effect of Adaptation on the Temperature Difference Limen.

Winfred McKenzie Atwood: A Physiological Study of the Germination of *Avena fatua.*

Eliot Blackwelder: Past-Cretaceous History of the Mountains of Central Western Wyoming.

J. Harlen Bretz: The Glaciation of the Puget Sound Basin.

George Smith Bryan: The Archegonium of *Sphagnum Subsecundum.*

George Damon Fuller: Evaporation and Soil Moisture in Relation to the Succession of Plant Association.

Lachlan Gilchrist: An Absolute Determination of the Viscosity of Air.

John William Edward Glattfeld: The Oxidation of d- Glucose in Alkaline Solution by Air as well as by Hydrogen Peroxide.

Edward Maris Harvey: Some Effects of Ethylene on the Metabolism of Plants.

John Benjamin Hill: The Anatomy of Six Epiphytic Species of Lycopodium.

Lee Irving Knight: A Study of Dormancy in Buds of *Liriodendron tulipifera.*

William Charles Krathwohl: Modular Invariants of Two Pairs of Cogredient Variables.

Paul Nicholas Leech: The Molecular Rearrangement of Tryaryl Methyl Hydroxylamines; a New Interpretation for the Rearrangement of Ketoxines.

Florence Anna McCormick: A Study of Symphyogyna Aspera.

Arthur Wesley Martin: Studies on Solutions in Anhydrous Formic Acid.

John Nathan Martin: Comparative Morphology of some Leguminosæ.

Maurice Goldsmith Mehl: The Phytosauria of the Rocky Mountain Region.

Wilson Lee Miser: On Linear Homogeneous Differential Equations with Elliptic Function Coefficients.

Frank Marion Morrison: On the Relation between some Important Notions of Projective and Metrical Differential Geometry.

Elton James Moulton: On Figures of Equilibrium of a Rotating Heterogeneous Fluid Body.

Loren Clifford Petry: The Anatomy of *Ophioglossum pendulum.*

Norma Etta Pfeiffer: Morphology of *Thismia* (*Bagnisia*) *americana* n. sp.

Ole Olufson Stoland: The Influence of Parathyroid Tetany on the Liver and the Pancreas.

Verne Frank Swaim: The Pressure Shift of Lines in the Spectrum of Zinc.

Charles Henry Swift: Origin and Early History of the Primordial Germ Cells in the Chick.

Ethel Mary Terry: The Velocity Coefficient of Saponification of Ethyl Acetate.

Lloyd Arthur Heber Warren: A Class of Asymptotic Orbits in the Problem of Three Bodies.

Herrick East Wilson: Evolutional Changes in the Monocyclic Crinoid Bases.

HARVARD UNIVERSITY

Edward Switzer Allen: Su alcuni Caratteri di una Serie Algebrica, e la Formola di de Jonquières per Serie qualsiasi.

Donald Clinton Barton: Arkose: Its Definition, Classification and Geologic Significance.

Sydney Adams Beggs: Certain Derivatives of Tetrabromortho-benzoquinone.

William T. Bovie: The Action of Ultra-Violet Light on Protoplasm.

Charles Franklin Brooks: The Snowfall of the Eastern United States.

Arthur Houston Chivers: The Fungus Genera *Chætomium* and *Ascotricha.*

Harry Clark: Sub-Helmholtzian Vibrations of a Rubbed String.

Farrington Daniels: An Electrochemical and Thermodynamical Investigation of Thallium Amalgams.

Harold Simmonds Davis: I. Contributions to the Determination of the Heats of Combustion of Organic Substances. II. The Effect of Gravity on the Concentration of a Solute. III. The Conductivity of Rosaniline Hydrochloride in Water and Certain Organic Solvents.

Gustave Alexander Feingold: Recognition and Discrimination.

Robert Chenault Givler: The Psycho-physiological Effects of the Speech Element in Poetry.

Rudolf William Glaser: Caterpillar Diseases with Especial Reference to the Wilt of Gipsy Moth Caterpillars.

Charles Merl Gruber: Neuro-muscular Fatigue.

Winthrop Perrin Haynes: A Contribution to the Geology of the Region about Three Forks, Montana.

Chester Elijah Kellogg: Alternation and Interference of Feelings.

Alfred Vincent Kidder: Southwestern Ceramics: their Value in reconstructing the History of the Ancient Cliff-dwelling and Pueblo Tribes. An Exposition from the Point of View of Type Distribution.

Francis Bullard Kingsbury: I. A Contribution to the Rôle of Bile in Fat Absorption. II. The Determination of Benzoic Acid in the Urines of the Rabbit and the Dog.

Clarence Cook Little: Experimental Studies on

the Inheritance of Color in Mice and their Bearing on Certain Allied Problems in Genetics.

Axel Leonard Melander: A Taxonomic Study of the Empididæ, a Family of Dipterous Flies.

William Buell Meldrum: I. A Possible Effect of an Alternating Current on Ionic Mobility. II. An Electrochemical Investigation of the Alkali Metals. III. A Contribution to the Study of Mixed Crystals.

Henry Thomas Moore: The Genetic Aspect of Consonance and Dissonance.

James Lucien Morris: Protein Metabolism of the Rat, with Special Reference to Tumor Problems.

Richard Harkness Patch: The Splitting of Aryl Carbinols under the Action of Substituting Agents.

Bradley Merrill Patten: A Quantitative Determination of the Orienting Reaction of the Blowfly Larva (*Calliphora erythrocephala* Meigen) to Light.

Rainard Benton Robbins: The Calculus of Variations as the Limit of a Problem in Minimizing an Algebraic Sum.

James Batcheller Sumner: The Formation of Urea in the Animal Body.

Walter Palmer Thompson: The Anatomy and Relationships of the Gnetales. I. The Genus *Ephedra*.

Frank Clifford Whitmore: I. The Mechanism of the Reactions of Sodium Malonic Ester with Halogenated Organic Compounds. II. Preliminary Studies of Certain Unsaturated Chlorides.

COLUMBIA UNIVERSITY

John Seaman Bates: Chemical Utilization of Southern Pine Waste.

Cora Jepson Beckwith: The Genesis of the Plasma-structure in the Eff of *Hydrachnia*.

Andrew Bender: The Preparation and Properties of Some New Derivatives of Pseudocumidine.

Laura E. W. Benedict: A Study of Bagobo Ceremonial, Magic and Myth.

Sidney Born: The Chemical Constitution of Invertase.

Albert Clarence Boyle, Jr.: Ore Deposits and Geology of the Bully Hill Mine and Its Vicinity, Shasta Co., California.

Robert P. Calvert: Dissociation Pressures of Ammonium and Tetramethyl Ammonium Halides and of Phosphonium Iodide and Phosphorus Pentachloride.

Dayton James Edwards: Compensatory Phenomena in the Distribution of the Blood during Stimulation of the Splanchnic Nerve.

Charles Reinhard Fettke: The Manhattan Schist Formation of Southeastern New York.

Fred Denton Fromme: The Morphology and Cytology of the Æcidium-cup.

Lyman Morse Kells: Complete Characterization of Dynamical Trajectories in n-space.

Louis Otto Kunkel: Physical and Chemical Factors Influencing Toxicity of Inorganic Salts to *Manilia Sitophila* Mont. Sacc.

Marguerite Thomson Lee: A Study of Modifications of the Binnet Test.

Victor Emanuel Levine: Biochemical Studies of Selenium.

Wallace A. Manheimer: Studies on the Sanitation of Swimming Pools.

Marion J. Mayo: The Relative Scholastic Ability of White and Colored Pupils in the High Schools of the City of New York.

Charles Packard: The Effect of Radium on the Development of *Nereis*.

Walter Frank Rittman: Thermal Reactions in Carbureting Water Gas.

Ernest Lyman Scott: The Content of Sugar in Blood under Common Laboratory Conditions.

Willard Lesly Severinghaus: Multiple Reflection of Short Electric Waves from Screens of Metallic Resonators.

Alfred Henry Sturtevant: The Behavior of the Chromosomes as Studied through Linkage.

UNIVERSITY OF ILLINOIS

Mikishi Abe: Statically Indeterminate Stresses in Rigidly Connected Structures of Reinforced Concrete.

William Ernest Carroll: Effect of the Amount of Protein Consumed upon Digestion and Protein Metabolism in Lambs and upon the Composition of Their Flesh and Blood.

William Walter Cort: Larval Trematodes from the North American Fresh-water Snails.

Stanley Prince Farwell: The Corona produced by Continuous Potentials.

Stanley Black Fracker: The Classification of Lepidopterous Larvæ.

John Earl Gutberlet: On the Development, Morphology and Economic Importance of Chicken Cestodes.

Harry Fielding Hadley: Phenol Extraction Methods as Applied to Coal and a Study of the Resulting Compounds.

Edward Otto Heuse: The Vapor Pressures of Aqueous Solutions of Electrolytes.

Edward August Theodore Kircher: Group Properties of the Residue Classes of Certain Kronecker Modular Systems and Some Related Generalizations in Number Theory.

Philip Augustus Lehenbauer: Growth in Relation to Temperature.

Harold Hossack McGregor: The Proteins of the Central Nervous System.

Louis Clark Mathewson: Theorems on the Groups of Isomorphisms of Certain Groups.

Earl Bowman Millard: The Hydration of Ions and the Influence of Viscosity on the Transference Number of Lithium Chloride.

Hubert Leonard Olin: The Coking of Coal at Low Temperatures with Special Reference to the Properties and the Composition of the Products.

George Wallace Sears: Atomic Weight of Tantalum.

Glenn Alfred Shook: A Determination of the Sun's Temperature.

Orrin Harold Smith: Retrograde Rays from the Cold Cathode.

John Hamilton Whitten: The Effect of Kerosene and other Petroleum Oils on the Viability and Growth of *Zea mais*.

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William Lee Dolley: Reactions to Light in *Vanessa Antiopa*, with Special Reference to Circus Movements.

Daniel Stanley Elliott: A Comparative Study of the Light Sensibility of Selenium and Stibnite at 20° and —190° C.

Edwin Louis Frederick: The Osmotic Pressure of Mannite Solutions between 10° and 40°.

Josiah Wesley Gain: Linear Combinants of Ternary Forms.

William Stuart Gorton: The Effect of Frequency upon the Corona.

Harry Clinton Gossard: On a Special Elliptic Ruled Surface of the Ninth Order.

Enoch Karrer: A Method of Determining the Radiant Luminous Efficiency of a Light Source by Means of a Cell whose Transmission Curve is Identical with the Luminosity Curve of the Average Eye.

Karl Spencer Lashley: Inheritance in the Asexual Reproduction of *Hydra*.

Herbert August Lubs: 1. The Action of Potassium Permanganate Upon 1-Phenyl-3-Thiourazole and 1-Phenyl-3-Thiomethylurazole. 2. The Tautomerism of 1-Phenyl-5-Oxy-4, 5-Dihydro-3-Triazolyl Methyl Sulphone. 3. The Tautomerism of the Amides.

Elmer J. Lund: The Relations of *Bursaria* to Food: I. Selection in Feeding and in Extrusion.

Donald MacKenzie: The Corona in Air at Continuous Potentials and Pressures Lower than Atmospheric.

Bessie Irving Miller: A New Canonical Form of the Elliptic Integral.

Annabella Elliott Richards: The Partial Enzymotic Hydrolysis of Yeast Nucleic Acid.

Henry Christian Schmeisser: Leukæmia of the Fowl: Spontaneous and Experimental.

Walter Francis Shenton: Linear Combinants of Systems of Binary Forms with the Syzygies of the Second Degree Connecting Them.

William Anthony Taylor: 1. On the Reactions of Both the Ions and Molecules of Acids, Bases and Salts. On the Reaction of Sodium Ethylate and Methyl Iodide in Absolute Ethyl Alcohol at 0°. 2. A Re-interpretation of the Work of Hecht, Conrad and Bruckner on the Reaction of Alkyl Halides with Sodium Ethylate at Different Temperatures. 3. On the Configurations of α and β Glucose and the Equilibrium between Mucic Acid and its Lactones.

Mabel Minerva Young: Dupin's Cyclide as a Self-dual Surface.

UNIVERSITY OF WISCONSIN

Ross Allen Baker: A Study of Certain *Aurous* Derivatives.

Elbert T. Bartholomew: Physiological Changes causing Black Heart in Potatoes.

Raymond Thayer Birge: A Detailed Study of the Long Wave-length Region of the Nitrogen Band Spectrum.

Ralph Howard Carr: A Study of the Non-protein Form of Nitrogen in Alfalfa.

Harry Alfred Curtis: A Quantitative Study of some Photochemical Reactions.

Gerhard Dietrichson: A Study of the Effect of Concentration on the Replacement of the Metals by One Another.

Howard Austin Edson: Damping off and Root Decay of Sugar Beets.

John Ironside Falconer: Agricultural Production in the United States from 1840 to 1860.

Edward Martinius Gilbert: Cytological Studies on the Tremellineæ.

Martin Perry Henderson: Studies on the Black Leg Disease of Cabbage.

Aaron Guy Johnson: The Helminthosporium Diseases of Barley.

George Wannamaker Keitt: Peach "Scab" (*Cladosporium carpophilum* Thüm) and its Control.

Orren Lloyd-Jones: An Analytical Study of Color in Pigeons in Relation to Inheritance.

Clifford Cyrille Meloche: Hesaralent Cerium.

Gilbert Morgan Smith: Organization of the Colony in Certain Form-celled Cœnobic Algæ.

Chester Snow: Electron Theory of Magnetism.

Otto Julius Zobel: Thermal Conduction and Radiation.

YALE UNIVERSITY

George Alfred Baitsell: Experiments on the Reproduction of the Hypotrichous Infusoria.

Norman Robert Blatherwick: The Specific Rôle of Foods in Relation to the Composition of the Urine.

Lewis Hill Chernoff: Pyrimidine Nucleosides.

Ernest Woodward Dean: The Effect of Constitution upon the Velocities of Hydrolysis of Esters of Substituted Monobasic Aliphatic Acids.

Wilson Barton Emery: Geology of Carrizo Mountain, Arizona.

Samuel Goldschmidt: The Metabolism of an Isomer of Xanthine and Some Isomers of the Methylxanthines.

Albert Garland Hogan: Studies on the Parenteral Utilization and the Metabolism of Sugars.

Arsène Nishan Lucian: The Distribution of the Active Deposit of Actinium in Electric Fields.

Leopold Reinecke: The Geology and Ore Deposits of the Beaverdell Map Area, British Columbia.

Joel Andrew Sperry: A Biochemical Study of the Behavior of Bacteria towards Pure Unchanged Animal and Vegetable Proteins.

William Mynn Thornton, Jr.: New Processes for the Analytical Separation of Titanium from Iron, Aluminum and Phosphoric Acid.

Edward Leffingwell Troxell: The Vertebrate Fossils of Rock Creek, Texas.

David Wright Wilson: The Chemistry of the Nitrogenous Extractives of Muscle Tissue.

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Benjamin Abram Bernstein: A Complete Set of Postulates for the Logic of Classes Expressed in Terms of the Operation "Exception," and a Proof of the Independence of a Set of Postulates due to Del Ré.

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Bruce Lawrence Clark: The Fauna of the San Pablo Group of Middle California.

Roy Elwood Clausen: On the Behavior of Emulsion in the Presence of Collodion.

Roy Ernest Dickerson: Fauna of the Martinez Eocene of California.

Daniel Walter Morehouse: On the Orbit of the Seventh Satellite of Jupiter.

Ludwig Rosenstein: A Study of Indicators.

Robert G. Sharp: *Diplodinium ecaudatum* with an Account of its Neuromotor Apparatus.

Walter Penn Taylor: The Status of the Beavers of Western North America, with a Consideration of the Factors in their Speciation.

Rosalind Wulzen: The Pituitary Gland in its Relationship to the Early Period of Growth in Birds.

CLARK UNIVERSITY

Marion Myrl Harrison: The Dynamics of the Formation and Decomposition of Tertiary Amyl Esters.

Wallace Frank Powers: An Experimental Study of Transient Induced Currents in Cylindrical Cores.

Lillian Rosanoff: Theory of the Catalysis of Sugar Inversion by Acids.

John Frederic William Schulze: A Study of Fractional Distillation.

James Atkins Bullard: On the Structure of Finite Continuous Groups.

Ivy Gertrude Campbell: The Social as the Leading Factor in Personality.

Robert Sidney Ellis: The Attitude toward Death and the Types of Belief in Immortality.

PRINCETON UNIVERSITY

Ralph Dennison Beetle: Congruences Associated with a One-parameter Family of Curves.

Julian Kalfus Dale: Studies of the Forms of Glucose and their Mutarotation.

Nelson Clark Dale: The Cambrian Manganese Deposits of Conception and Trinity Bays, Newfoundland.

Haig Galajikian: A Type of Non-linear Integral Equations.

Albert Orion Hayes: Geology of the Wabana Iron Ore of Newfoundland.

John Minor Stetson: Conjugate Systems both of whose Laplace Transforms are Lines of Curvature.

Vernon Andrew Suydam: Total Radiation from Metals.

UNIVERSITY OF MICHIGAN

Suzan Rose Benedict: A Comparative Study of the Early Treatises Introducing into Europe the Hindu Art of Reckoning.

Joseph Edgar DeCamp: A Study of Retroactive Inhibition.

John Henry Ehlers: Winter Temperature of the Leaves of the Pine.

George Allan Lindsay: A Study of the Longitudinal Vibrations of Wires.

Anton Augustus Schlichte: The Changes which Take Place in Hides during the Unhairing Process.

UNIVERSITY OF PENNSYLVANIA

Ezra Allen: The Cessation of Mitosis in the Central Nervous System of the Albino Rat.

Charles Blizard Bazzoni: The Destruction of Bacteria through the Action of Light.

Louise Stevens Bryant: School Feeding.—Its History and Practise at Home and Abroad.

Edward Ellsworth Marbaker: The Separation of Tungsten from Molybdenum.

Stanley Pulliman Shugert: König's Resolvents and Other Types of Symmetric Functions.

BROWN UNIVERSITY

Robert Gamble Caswell: A Study of the Reduction Products of Some Aromatic Compounds.

Harold William Lyall: A Contribution to the Study of the Streptococci.

George Henry Robinson: Isolation, Identification and Serum Reactions of Typhoid and Paratyphoid Bacilli.

Lester Angell Round: Contributions to the Bacteriology of the Oyster.

UNIVERSITY OF MINNESOTA

Harold Hiram Brown: Contribution to our Knowledge of the Chemistry of Wood; Douglas Fir and Its Resin.

Harry Vaughn Harlan: Some Distinctions in Our Cultivated Barleys with Reference to their Use in Plant Breeding.

Julius Valentine Hofmann: Natural Reproduction of Coniferous Forests.

BRYN MAWR COLLEGE

Louise Duffield Cummings: On a Method of Comparison for Triple Systems.

Vernette Lois Gibbons: The Potentials of Silver in Non-aqueous Solutions of Silver Nitrate.

UNIVERSITY OF CINCINNATI

Emma Lucy Braun: The Physiographic Ecology of the Cincinnati Region.

Ralph Esward Oesper: Oximidocarbonic Esters and Related Compounds.

GEORGE WASHINGTON UNIVERSITY

Philander Betts: An Investigation of the Rates of the Wildwood Water Works Company.

Hartley Harrad Thompson Jackson: The Biota of Ridgeway Bog, Wisconsin: A Study in Ecology and Distribution.

INDIANA UNIVERSITY

Clarence Edmunds Edmondson: The Effects of Thyroid and Thymus Extract upon the Growth and Reproduction in *Paramecium caudatum*.

Thomas Edward Mason: Character of the Solutions of Certain Functional Equations.

UNIVERSITY OF IOWA

Victor Josiah Hays: The Adrenals of Birds.

Ralph Chase Huston: Some Derivations of Pure Xylene.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

George Howard Burrows: Equilibria and Free Energies of Organic Reactions.

Wilford Joseph Winninghoff: The Ionic Theory.

STANFORD UNIVERSITY

George Shambaugh Bohart: Reactions between Potassium Amide and Certain Salts of Cadmium Nickel and Chromium in Liquid Ammonia Solution.

John Dustin Clark: A Chemical Study of the Enrichment of Copper Sulfide Ores.

UNIVERSITY OF MISSOURI

William Henry Chandler: The Killing of Plant Tissue by Low Temperature.

UNIVERSITY OF NEBRASKA

Melvin Randolph Gilmore: On the Uses of Plants by the Indians of the Nebraska Region.

NEW YORK UNIVERSITY

John Daly McCarthy: The Influence of Certain Drugs on the Efficiency of Mental Work.

UNIVERSITY OF NORTH CAROLINA

James Talmage Dobbins: The Action of Ammonia on Solutions of Arsenic Triiodide in Organic Solvents.

UNIVERSITY OF VIRGINIA

Sterling Henry Diggs: The Influence of the Concentration of Potassium Iodide on the Rate of Diffusion of Iodine in Potassium Iodide Solution.

WASHINGTON UNIVERSITY

Jacquelin Smith Cooley: A Study of the Physiological Relations of *Sclerotinia cinerea* (Bon.).

THE CONSTITUTION OF ATOMS

THE Physical Society of London visited Cambridge, and at a meeting in the Cavendish Laboratory, June 20, Sir J. J. Thomson, the president, gave information of the results of some important experiments he has been making with regard to the production of very soft Röntgen radiation by the impact of positive and slow cathode rays. According to the report in the London *Times* Professor Thomson said he proposed to give them an account of some recent experiments whose object it was to fill up a gap in the kind of radiation that they had at their disposal upon investigation of the properties of the atom. The study of Röntgen radiation had enabled them to prove the existence of two separate rings of electrons, one inside the other; the one was responsible for what is known as the K kind of radiation, and the other had the L characteristic, but the L characteristic was so much softer than the K that if they were to consider what would be likely to be the properties of the radiation given out by a third ring, if the rate of increase in softness was anything like the same proportion the radiation from the third ring would come well within that region of radiation which at present had not been studied, and if they command a continuous series of radiations, extending from the visible light which affected the outer ring of electrons right up to the hardest region of radiation, they would be able to see how many separate vibrating systems, how many rings of electrons there were inside the other, and, more than that, they would be able, by the study of that radiation, to gauge the number of electrons in each ring, so that this study promised to give them the means of determining the distribution of electrons throughout the atom. In the experiments two methods had been employed. The first was the production of Röntgen radiation by the impact of positively charged atoms. By availing himself of the very remarkable sensitiveness of the Schuman photographic plate they had been enabled to get unmistakable evidence that as the positive rays impinged against a surface they gave out a type of Röntgen radiation. Professor Thomson described at length the apparatus he employed, which in this case was a Crookes tube, and the experiments he made. His second method was by the impact of cathode rays, and they arranged the experiment so that they had the speed of the cathode rays very much under control. In this experiment an ordinary Röntgen ray tube was employed. The photographic method, Professor Thomson continued, was rather time wasting, and they had lately tried experimenting with a substitute for the photographic plate, and if they succeeded with those experiments they probably would be able to get on much more quickly. But even with the photographic plate they hoped to make a series of experiments which would enable them to find how many rings of electrons there were in an atom.

HENRY HEMPHILL

WE have just received notice of the death, July 25, at Oakland, Cal., of Henry Hemphill, in his eighty-fifth year.

Mr. Hemphill was born in Wilmington, Del., in 1830, but for many years had been a resident of the state of California. He was a mason by trade and took great pride in his proficiency. More than fifty years ago he became interested in the shells of the Pacific coast and formed one of a group of enthusiastic collectors which included Kellogg the botanist, Harford, Voy, Stearns and others, of which he was the last survivor. His trade brought him in, at California union wages, such a good income that he could not only lay away a fair nest egg for his old age, but take long vacations. During these periods he visited Florida and all parts of the Pacific coast south of British Columbia, and became one of our most expert collectors of mollusks. The genus of slugs, *Hemphillia*, was named in his honor by the late W. G. Binney, and a host of species commemorate in like manner his success as a collector.

He published but few papers himself, but was the cause indirectly of much publication by others. He had a keen eye for relationships and differences, and at times mounted on large tablets series of land shells with radi-

ating lines of variation which were most instructive, and which found a place in some of the most important museums. He had been long a widower, and, as age diminished his energies, he retired to Oakland, where for the last few years he made his home with an only daughter. His kindly ways and generosity to others will keep his memory green among those who knew him. He left what is doubtless the best and most complete collection of Pacific coast shells, up to the time of his retirement, that is to be found anywhere except in the National Museum. It is particularly rich in series showing variation, and in the land shells; also including much valuable exotic material received in exchange. It is to be hoped that this collection may be preserved intact in one of the public institutions of the Pacific coast, as at present a collection of shells worthy of the state of his adoption does not exist in any university or museum west of the Rockies.

Wm. H. Dall

SCIENTIFIC NOTES AND NEWS

On account of the international crisis, the meeting of the American Chemical Society, which was to have been held in Montreal in September, has been indefinitely postponed.

Dr. Max Rubner has been appointed director of the Kaiser Wilhelm Laboratory for Physiology to be erected in Berlin.

Dr. Karl Runge, professor of applied mathematics at Göttingen and several years since visiting professor to Columbia University, has been elected Prorektor of the University of Göttingen.

Dr. Wilhelm Waldeyer, professor of anatomy at Berlin, celebrated the fiftieth anniversary of his doctorate on July 20.

Dr. Alexis Carroll, of the Rockefeller Institute for Medical Research, is reported to have gone to the front as a French army surgeon.

Lord Welby has been elected president of the Royal Statistical Society.

Dr. Severance Burrage, professor of sanitary science in Purdue University, has been elected president of the Indiana Academy of Sciences.

Dr. Mazyck P. Ravenel, who recently resigned the chair of bacteriology in the University of Wisconsin to accept a similar chair in the University of Missouri, has been appointed a member of the advisory board of the hygienic laboratory of the United States Public Health Service, Washington.

Major Thomas L. Rhodes has been transferred to the Panama Canal service, and has been appointed superintendent of the Colon Hospital.

Dr. Oscar Riddle, of the Carnegie Institution, delivered the annual address before the American Academy of Medicine at its Atlantic City meeting on the evening of June 19. His subject was "The Determination of Sex and Its Experimental Control."

"Panama and the Canal" was the subject of an illustrated lecture at the University of Chicago on August 17, by Mr. Frank A. Gause, superintendent of the schools of the Canal Zone.

Professor H. L. Fairchild delivered a lecture on "Ancient Sea Margins in the Hudson and Connecticut Valleys" before the students of geography and geology at the Columbia University summer session on August 12.

The name "Rio Theodoro" has been given by the Brazilian government, at the suggestion of Dr. Müller, Brazilian secretary of state for foreign affairs, to the river recently explored by Mr. Roosevelt's expedition, and heretofore known as the Rio da Duvida.

We learn from *Economic Geology* that the Division of Mines of the Bureau of Science, Philippine government, has recently suffered the loss of Mr. Paul R. Fanning, metallurgist, who is now metallurgist for a zinc company, and Mr. Frank T. Eddingfield, mining engineer, who has reurned to Washington. Mr. Wallace E. Pratt, geologist, has returned from six weeks' reconnaissance work in the Caramoan Peninsula, southeastern Luzon, where there exists a very interesting area of schistose rocks. He also made an examination of an iron deposit on a small island in the mouth of

Mambulæ Bay, Ambos Camarines. Warren D. Smith, chief of the division, has returned from two months' field work in northern Luzon in the territory of the Kalingas and Ifugaos. He secured a collection of fossil plants and also marine tertiary fossils. Mount Amuyo, the second highest peak in Luzon, was ascended and its elevation determined by hypsometer. The extension of the Benguet and Mancayan-Suyoc mineral belt was traced and new areas indicated for prospecting.

THE Royal Society of Arts has received from Mr. R. Le Neve Foster £100 to found a prize in memory of his father, the late Mr. Peter Le Neve Foster.

A MOVEMENT for the foundation of a Scottish Oceanographical Institute in Edinburgh, to be a memorial to the late Sir John Murray, has been inaugurated, a committee having been formed for the purpose of considering how such an institution may best be organized, with power to issue an appeal for funds. The members of the committee include Lord Stair, president of the Royal Scottish Geographical Society; Professor James Geikie, president of the Royal Society of Edinburgh; J. Y. Buchanan, of the Challenger Expedition; Dr. W. S. Bruce and others.

DR. ALBERT SMITH BICKMORE, superintendent of the American Museum of Natural History from 1869 to 1904 and subsequently in charge of the department of public instruction until his retirement as professor emeritus in 1904, died on August 13, at the age of seventy-five years.

THE death is announced of M. Fernand Foureau, the explorer of the Sahara and governor of the colony of Martinique, at the age of sixty-four years.

DR. JOSEF HANNACK, a distinguished Austrian engineer, has died at the age of fifty-nine years.

PROFESSOR HERMANN KLEIN, of Cologne, known for his contributions to astronomy and meteorology, has died at the age of seventy years.

THE U. S. Civil Service Commission announces an examination for specialist in industrial education to fill a vacancy in this position in the Bureau of Education, at a salary of $3,500 a year. The duties of this position will be performed at Washington, D. C., and elsewhere, and will include the study of vocational education, the collection and compilation of information relating thereto, and the giving of advice to education officers throughout the United States for the establishment of courses of study in vocational education.

DR. HRDLIČKA, secretary of the Nineteenth International Congress of Americanists, writes that unless unfavorable conditions due to the war in Europe make a change in date imperative, the congress will be held at Washington as announced, October 5 to 10.

THE eighth meeting of the Italian Society for the Advancement of Science will be held at Bari on October 8–13, 1914, under the presidency of Professor Camillo Golgi.

THE International Pharmaceutical Federation planned to meet at Berne on August 7 and 8 under the presidency of Professor L. van Itallie.

THE Swiss *Naturforschende Gesellschaft* offers prizes for the solution of the following problems: For June 1, 1915: "To Investigate Radioactivity and Electricity of the Atmosphere in the Alps, the Jura and Intermediate Regions." For June 1, 1916: "The Phenomenon of Twilight according to Former and New Observations in Switzerland."

ACCORDING to the *Scientific American* the South American expedition of the University of Pennsylvania Museum has completed a year of highly successful exploration in the region lying along the boundary between Brazil and the Guianas. Besides important geographical discoveries, the expedition has obtained ethnological information relative to twelve different tribes, half of which were hitherto entirely unknown, including vocabularies and other linguistic studies, anthropometric measurements, collections of myths and legends, and about 600 photographs. The next work of the expedition will probably be in the territory drained by the upper Rio Negro and the upper Orinoco.

The Paris correspondent of the *Journal* of the American Medical Association reports that the Société française d'eugénique, will organize, at the beginning of the school year, a series of lecture courses in eugenics at the Ecole des hautes études sociales. M. Edmond Perier, director of the Muséum d'histoire naturelle, will show the relations which exist between eugenics and biology; Dr. Apert, physician at the Andral Hospital, will discuss the questions of heredity related to those of eugenics; Dr. Papillault, professor of sociology at the Ecole d'anthropologie, will show how, thanks to eugenics, a well-defined selection may be made; Dr. Pinard, former professor of clinical obstetrics at the Faculté de médecine de Paris, will study eugenics and child-culture; Dr. Weiss, professor at the Faculté de médecine de Paris, will discuss eugenics in its relation to physical culture; Dr. Schreiber, head of the clinic affiliated with the Faculté de médecine de Paris, will show how one ought to understand eugenics from the point of view of marriage; Dr. Roussy, director of scientific research at the Ecole des hautes études, will study eugenics and the perfecting of the human race.

The U. S. Coast and Geodetic Survey has published "Results of Observations made at the Magnetic Observatory near Tucson, Ariz., in 1911 and 1912." This publication contains hourly values of the magnetic declination, horizontal intensity and vertical intensity for the two years, based on the continuous photographic record of the magnetograph. It furnishes the means of correcting field magnetic observations for the effect of the diurnal variation and magnetic storms, and adds to the data available for a study of the causes of these and other fluctuations to which the earth's magnetism is subject. It contains also a table giving the times at which earthquakes were recorded by the seismograph at the observatory. This publication is the second one of the Tucson series, the work of that observatory having been started in November, 1909, and may be obtained free of charge by addressing the Division of Publications, Department of Commerce. Similar series of publications are available for the other magnetic observatories of the Coast and Geodetic Survey as follows: Cheltenham, Md., 1901–1912; Baldwin, Kans., 1901–1909; Honolulu, T. H., 1902–1912; Sitka, Alaska, 1902–1912; Vieques, Porto Rico, 1903–1912.

The *British Medical Journal* states that the annual general meeting of the Lister Institute of Preventive Medicine was held at the institute, Chelsea Gardens, on May 13. Sir John Rose Bradford, who last year succeeded Sir Henry Roscoe in the chairmanship of the governing body, presided. The report pointed out that the institute had borne a share in several collective inquiries of importance. Dr. Ledingham had continued to supervise the bacteriological examination of material from cases diagnosed as typhoid fever or suspected typhoid, and had drawn up a report—published in the annual report of the medical officer to the local government board—on the work done by him in conjunction with Dr. Theodore Thomson, of the local government board, in making bacteriological examinations of typhoid convalescents at intervals for several months after discharge from the hospitals of the metropolitan asylums board. An extensive inquiry into the bacteriological and chemical purity of dried milk, creams and foreign pasteurized milks had been undertaken for the local government board by the bacteriological and biochemical departments of the institute, and over 3,000 samples of milk had been examined for tubercle bacilli for the London county council and a large number for the health departments of various boroughs. The report also contained a reference to the eighth report of the investigations into plague, carried out under the auspices of the advisory committee, consisting of representatives of the institute, the India Office, and the Royal Society. Inquiries during the year had been proceeding both in India and at the institute's special isolated laboratories at Elstree. It is added that by arrangement with the metropolitan asylums board the research pathologist of that authority, Dr. Mair, has accommodation at the institute. The accounts for the year ending December 31, 1913, show an excess of income over expenditure of £750 at Chelsea,

and £4,938 at Elstree. The report contained the following paragraph with reference to a matter which is now exciting a great deal of attention: "In view of the new department of medical research now being established by H.M. government in accordance with the provision in the National Insurance Act of 1911, the governing body has been considering whether it would not be in the interest of medical science in this country that they should recommend to the members of the institute to offer, under conditions, to the nation, the organization and resources of the Lister Institute, as the nucleus of the government scheme. At present, however, the governing body are not in a position to make any more definite statement or recommendation on the subject." Sir Rickman Godlee made some inquiries with regard to the subject raised by this statement. He asked whether it was proposed to hand over the institute at Chelsea to the government, and to discontinue the department at Elstree, and the preparation of serums. The chairman said that the proposal to hand over the institute to the government had not gone beyond an interchange of views with the medical research committee presided over by Lord Moulton as to the conditions under which the institute might be presented to the nation; the conversations included the discussion of financial arrangement, but it was not possible to say more at the moment. In reply to Dr. Sidney Turner, who expressed some apprehension that the character of the work done at the institute might deteriorate if it passed under the control of a government committee, the chairman and treasurer said that they were not in a position to make any further statement. The governing body also reported that it had during the year received a munificent legacy, amounting with interest to £17,303, bequeathed by the late Lord Lister, and that it had been arranged to utilize this bequest to give practical effect to a scheme the governing body had for some time been desirous of setting up—to make provision for the superannuation of members both of the higher and the subordinate staffs of the institute on attaining the age of 65 years, or in special cases that of 60 years. It is proposed to allow the bequest to accumulate at compound interest until such time as, some years hence, the pension claims begin to mature. To this fund the governing body will add £700 annually from the general income of the institute.

MEMBERS of the British committee for the economic preservation of birds have issued a statement recommending the following six suggestions as a working basis: (1) Absolute protection during breeding season for all breeding wild birds of whatever kind. (2) Absolute protection for all birds found upon inquiry to be either verging upon extinction, highly localized, or of determined benefit in agricultural centers. These birds to be known as "Birds of Class I." (3) Regulations to be enforced by government or local authorities under government for species that have commercial value and are not in danger. These birds to be known as "Birds of Class II." The government of the countries of origin to tax the sale of these species and thereby recover the cost of enforcing regulations. (4) The permanent maintenance of an international committee of scientific experts to determine year by year which species belong of right to the respective classes. (5) An international agreement to refuse importation to the world's markets, museums and private collections of all species that are found to belong to "Class I." (6) All species in "Class II." to be exported under license. The committee would place at once in "Class I." the following birds: The family of chatterers, the cattle egret, the resplendent trogon, the lyre birds, the rifle bird of Australia, the regent bower bird, the flamingo, the spoonbills, the trogopans, the Impeyan (monal) pheasants, the red bird of paradise of the Waigu Island, the Prince Rudolf, Lawes's, Prince Wilhelm's, Rothschild's, Princess Stephanie's and Meyer's bird of paradise.

IN connection with the development of the Langley Aerodynamical Laboratory of the Smithsonian Institution, which was reopened in May, 1913, by action of the regents of the institution, Dr. A. F. Zahm, the recorder of

the laboratory, recently made a trip abroad investigating the European aeronautical laboratories. His report forms publication 2,273 of the Smithsonian Miscellaneous Collections, and is the third dealing with the interests and activities of the laboratory. It covers the equipment and scope of the principal European laboratories and shows what steps are being taken by them toward the perfection of the art of flying and the science of aeronautics. Accompanied by Assistant Naval Constructor Jerome C. Hunsaker, U. S. N., Dr. Zahm visited the principal aeronautical laboratories near London, Paris and Göttingen, to study, in the interest of the institution, the latest developments in instruments, methods and resources used and contemplated for the prosecution of scientific aeronautical investigations. Incidentally they inspected many of the best aerodromes or flying fields, and air crafts factories in the neighborhood of these cities, making copious notes on their observations. Aeronautical libraries were also visited, and comprehensive lists of the best and latest publications on this subject prepared for the use of the laboratory library. The following laboratories were examined: Aeronautical research and test establishments of the British government near London; the Institut Aerotechnique de St. Cyr and the Laboratorie Aerodynamique Eiffel, near Paris; the Göttingen Modelversuchsanstalt, in the city of that name, and the newly organized laboratory adjoining the flying field at Johannisthal, near Berlin, known as the Deutsche Versuchsanstalt für Luftfahrt zu Adlershof. All these establishments, the author states, are devoted both to theoretical and practical investigations, under the direction of highly trained men who not only serve as executives and initiate the researches, but lend their personal assistance in the various technical experiments. They differ as to endowment; those in England and Göttingen being supported by governmental grants, the others by private capital. The laboratories near London, at St. Cyr and Adlershof, are broad in their scope, but the Eiffel and the Göttingen laboratories confine their activities mainly to wind-tunnel experiments. The experimental procedure of each is noted, and the buildings and apparatus of the different plants are carefully described. The purpose of the Langley laboratory is primarily to plan and conduct such theoretical and experimental investigations, tests and reports as may serve to increase the safety and efficiency of aerial locomotion for commercial advance and national defense.

UNIVERSITY AND EDUCATIONAL NEWS

Mr. Daniel Baugh, the founder of the Baugh Institute of Anatomy, Jefferson Medical College, Philadelphia, has purchased and added to his original gift, the premises 236 and 238 Pine Street, as an addition to the school, and has given $5,000 for the improvement and equipment.

The new laboratory of medical sciences at the University of Chicago will be located on the west side of Ellis Avenue, and will have a frontage of approximately one hundred and eighty feet and a depth of about fifty feet, with wings at the north and south ends fifty feet in width and extending back eighty feet. The new building will consist of general and private laboratories, research laboratory rooms, class- and working-rooms, and also an assembly room in the rear, thirty by forty feet, to accommodate one hundred and fifty to two hundred students. The building, one story in height, will be of brick exterior. This new laboratory will be occupied by the department of hygiene and bacteriology and the department of pathology. The work is already under way, and it is expected that the building will be ready for occupancy at the opening of the autumn quarter on October 1. The cost of the building will be about $50,000. The university board of trustees has voted to give the name of Howard Taylor Ricketts to the new laboratory. Dr. Ricketts, who was connected with the department of pathology at the university for eight years, died in Mexico from typhus fever, which he contracted while investigating the disease.

Ward L. Ray, B.A. (Oregon), M.A. (Wisconsin), professor of chemistry and physics at William and Vashti College, has been elected

president of the institution. The college, which is at Aledo, Ill., has received an addition to its endowment of $25,000, a gift from Mr. Ed. Drury.

THE board of administrators of Tulane University of Louisiana have elected Mr. Henry L. Freeman to be acting assistant professor of mechanical engineering for one year to supply the place of Mr. J. M. Robert, who has been granted leave for one year. Dr. Wallace Wood has been elected dean of the department of dentistry to succeed Dr. A. G. Friedrichs, resigned.

DR. VIRGIL H. MOON, of the Memorial Institute for Infectious Diseases, Chicago, has been appointed head of the pathology department of the Indiana University Medical College at Indianapolis.

DR. JAMES W. JOBLING, formerly pathologist of the Michael Reese Hospital, has been appointed professor of pathology in the Vanderbilt University, Nashville, Tenn.

DR. ARNOLD V. STUBENRAUCH, for some years past in charge of the pomological investigations of the United States Department of Agriculture, has gone to California to become head of the new division of pomology in the University of California.

DR. VICTOR E. SHELFORD has been appointed assistant professor of zoology in the University of Illinois on part time and biologist in the Illinois State Laboratory. He will apply the experimental methods which he has developed to the problems of the state laboratory.

MR. RALPH MCBURNEY, graduate of the Virginia Polytechnic Institute and M.S. from Oklahoma Agricultural College, has been appointed instructor in the department of bacteriology of the Oregon Agricultural College.

MR. ROGER L. MORRISON, highway engineer with the United Gas Improvement Company of Philadelphia, who received the degree of master of arts at Columbia University last June after having completed the graduate course in highway engineering, has been appointed professor of highway engineering in the Agricultural and Mechanical College of Texas.

MR. A. J. MARGETSON, assistant professor at the City and Guilds (Engineering) College, Kensington, has been appointed to the professorship of civil and mechanical engineering at the Technical College, Finsbury, in the place of Professor E. G. Coker.

PROFESSOR LEON ASHER has been elected professor of physiology at Berne.

DISCUSSION AND CORRESPONDENCE

THE LIFE OF ISOLATED LARVAL MUSCLE CELLS

IN the course of some experiments on the culture of the cells of *Diemyctylus* larvæ outside the body a few preparations were made of isolated larval muscle cells in the plasma of the adult animal. The usual hanging drop cultures were employed, and the slides were kept for a part of the time in an ice chest, and for a part of the time at ordinary room temperature. The muscular tissue was taken from the myotomes of the tail, and teased apart more or less so as to isolate some of the cells. The cells when isolated were not completely differentiated. They were from two to three times as long as thick and only their outer portion was fibrillated, leaving an inner core of undifferentiated protoplasm containing the single nucleus.

The isolated cells were examined from time to time to see if they were undergoing further differentiation. During the eight months in which they were kept under observation they had not changed their form, nor had they undergone any marked changes in structure. To all appearances they were healthy; at least they showed no signs of deterioration such as dead or dying cells usually manifest. But were they really alive?

This was tested by ascertaining if they would respond to a stimulus by contracting. A stimulus was applied by heating a needle and applying the point to the cover slip immediately over a particular cell. The muscle fibers so stimulated almost always responded by a vigorous twitch. Relaxation of the fiber followed almost immediately, and several contractions could often be evoked from the same cell. Muscle cells kept for eight months *in*

vitro showed vigorous twitches, even in preparations in which the culture medium had not been changed.

I have observed that threads of fibrin when affected by the local application of heat will also contract and quickly extend again. The muscular contractions observed are not dependent, however, on any contraction of the medium around the cell, since they occur as well in the fluid of blood serum as in the coagulum of plasma, and are much more decided and vigorous than the contractions similarly evoked in threads or sheets of fibrin. Similar experiments with muscle fibers isolated from adult amphibians gave negative results, even though the fibers were kept for only a few days in hanging drop cultures.

While isolated larval muscle cells gave little evidence of further differentiation, it was found that in several larger pieces of the same larvæ, containing a number of different tissues, muscle fibers became more elongated, and had differentiated in other respects much as in the course of normal development. In one set of experiments tails of *Diemyctylus* larvæ were cut into several pieces which were kept in Ringer's solution. These pieces were seen to undergo differentiation in many ways. Through the absorption of water they increased greatly in size. The muscle fibers of these pieces became not only more elongated, but more completely fibrillated. It is probable that tension is required to cause myoblasts to increase in length, and this tension was supplied, in the pieces observed, by the general increase in size. It is not improbable that other stimuli arising from the association of the myoblasts with other cells occasioned their further differentiation in structure.

The persistence of larval muscle fibers in an active condition for eight months is a fact of interest in relation to the tendency of the muscles of the adult animal to atrophy when deprived of their nerve supply and hence of their usual stimuli to functional activity. The dependence of muscle upon nerve is a secondary acquirement, for several experiments have shown that the early differentiation of myoblasts proceeds in a normal way after the removal or destruction of the nervous system. In the young larvæ from which the muscle cells were isolated in my experiments the muscular tissue had not come to depend, to any considerable extent, upon nervous stimulation.

S. J. Holmes
University of California

Fiat Nomenclature

In the "Eighth List of Generic Names (Mammals) under consideration in connection with the Official List of Zoological Names," published in Science for July 10, we get an enlarged view of what the International Commission is expected to do with its "plenary power authority." Though only sixteen names are now presented for "fixation by fiat," large possibilities are revealed, since thousands of such cases could be developed.

The orang, evidently the pet of the menagerie, is allowed to steal the generic name that belongs to the Barbary ape, and the specific name that belongs to the chimpanzee. As the Barbary ape is the type of the genus *Simia* Linnæus, the generic name used for the orang will need to be distinguished as *Simia* Fiat. The orang's specific name must be *Simia satyrus* Fiat, *Simia satyrus* Linnæus being the original name of the chimpanzee. It would be interesting to know why the orang should discard his original Linnæan specific name *troglodytes*. Fiat will easily become one of the most prolific authors, with such facilities for displacing clearly established names, including those of Linnæus.

It must be a fine thing to have this "plenary power authority," and feel able to correct the errors and improprieties that are always creeping into nomenclature. At last we are in the way to follow the golden counsel of Rafinesque, to keep on giving names until we find the most appropriate. Fiat, as we have seen, is to fix specific names as well as generic, and can also "fix the most classical form of the name, not necessarily that which was first used." Anything that seems "advisable" may be done. Thus:

An early reference by Pallas in connection with *Oryx gazella* makes it advisable to affix the name

Gazella to the gazelles before it is attempted to be used for the gemsbucks.

Of course the name *Gazella* would remain with the gazelles if Pallas applied it to them before it was applied to the gemsbucks, but if a suggestive passage in an older author makes it "advisable to affix the name" in advance of any formal nomenclatorial application, why need we hesitate longer to restore the classical names from Pliny, Virgil, Theophrastus, Aristotle, Homer, Solomon or Moses?

Such improvements may not appear to lie exactly in the direction of those that the International Commission was expected to supply, but why object to one good thing because we do not get another? It is evident from these proposals for "fixation by fiat" that the results reached by the International Commission through the "Code of Nomenclature" will not command the unqualified approval of the interested public. The underlying reason may be that the Code is not based on consistent principles, but incorporates certain imperfect ideas that happened to be current when the work was undertaken. The general substitution of the method of types for the method of concepts was then only beginning and the fundamental nature of this reform was not appreciated. In particular, there was a failure to see that the custom of determining the application of generic names through elimination was inconsistent with the method of types.[1]

As soon as we admit that a name must relate to a type, and agree to treat this relation as inviolate, there are no problems to be solved by elimination. It is this that renders the method of types so superior to the method of concepts as a means of securing permanence in nomenclature. The application of a generic name is fixed as soon as the type species is determined, and does not depend upon the action of later writers. The historical names remain in their original places instead of being transferred to other groups, as often results from elimination. The attempt to combine two methods that were essentially inconsistent developed so many complications that a court of experts seemed to be necessary, and the Commission was established. But now the "plenary power authority" relieves the Commission from the task of applying its own rules and allows names to be adopted or rejected as may appear "advisable."

Another advantage conferred by the method of types is the right to exclude generic names that were not applied to binomial type species. In our specific nomenclature we confine ourselves to binomial species, and there is the same propriety in refusing to admit generic names that did not have binomial species as types. Many of the well-known names that now figure in lists of *nomina conservanda* have been placed in jeopardy only by ill-considered revivals of obscure, abortive names that would have been left in oblivion if this simple requirement had been observed. With a code drawn in better accord with the method of types, which is now in use by nearly all systematists, there would be less need of "plenary power authority" and "fixation by fiat."

O. F. COOK

WASHINGTON

[1] Cook, O. F., "Terms Relating to Generic Types," *The American Naturalist*, 48: 308, May, 1914.

MUSEUMS OF SOUNDS

IF museums of sights, why not museums of sounds? The curator of that hot bed of new and improved varieties of museum ideas, the Children's Museum, in Brooklyn, New York, reminded me that a large number of the children who visited it were unable to get away from the crowded city during vacation, and stated that she thought a victor-victrola, installed in the museum with samples of the best music would be appreciated by these children and do them good. Some museum authorities might think this quite improper, and not at all dignified; although as a matter of fact some of our leading scientific museums do have study collections of phonograph records of Indian music; but in the way of public exhibitions a children's museum can freely do things which only a brave and radical scien-

tific museum or natural-history museum dare attempt, for a children's museum is for children rather than for nature or art.

Free organ recitals are given twice a week at the Museum of Science and Art in Glasgow, and these recitals have had a direct effect in increasing the sale of good music in competition with poor music. The *Bulletin of the John Herron Art Institute* in Indianapolis announces a musical program for Sunday afternoons in January. There may be other museums of science or art that have undertaken something similar.

There might be other kinds of museums than those in which people get benefit only through their eyes. Most of us have four other senses, hearing, feeling, tasting and smelling. I am not sure that I would as yet advocate a museum of odors, but a museum of sound might be not only interesting, but valuable. It might start with a victor-victrola. The records might include not only samples of the best music of the world by the world's great artists, but samples of the music of various kinds of instruments, of various kinds of mankind, as for instance, of the Negro, the Eskimo and the Chinaman, and of great oratory. On the other hand, there might be records for the city dweller who has never had a chance to hear such things as the lowing kine, the rattle of the rattlesnake, the yelp of the coyote, the songs of birds, rare or otherwise, the hum of a swarm of bees, the roar of the waves, the jingle of the chains of a wagon freight train, and the creak of ox carts. Bird songs are probably of as much interest to museum visitors as bird skins. Such a museum would probably be as attractive to the average citizen as a flower-garden or an art museum is to the European immigrants, who throng our great museums on Sundays and holidays to the noticeable shame of the lack of appreciation of many of the American born, who prefer a different recreation. It would be a great boon to some humble lovers of music to have a chance to hear, free of charge, examples of classical and the best modern music.

Harlan I. Smith

SCIENTIFIC BOOKS

The Quaternary Ice Age. By W. B. Wright, member of the Geological Survey of Ireland. Illustrated. London and New York, Macmillan and Company. 1914. Pp. xxiv and 464. Price $5.00.

The volume is opened by brief discussions (46 pp.) of glaciers and ice sheets and the glacial drift. Then follow in succession the glacial and associated features of the British Isles (56 pp.), the glaciation of the Alps (31 pp.), of northern Europe (25 pp.) and of North America (15 pp.), attention being given in each case to centers of ice dispersion and to general characteristics of the drift with more or less attention to relative amounts of weathering and erosion. The lakes of the great basin of the western United States are given a chapter of 23 pages. Then follow discussions of the loess (24 pp.), of the Quaternary Mammals (30 pp.), and of Quaternary Man (42 pp.). Two chapters, 33 pages, deal with theories of the Ice Age, and the insufficiency of any and all is declared. Four chapters, 101 pages, are devoted to the late Quaternary oscillations of level (interpreted in the light of the isostatic theory) in Fenno-Scania, in the British Isles, and in North America. Following this and concluding the work are brief remarks on post-Glacial changes of climate in northwest Europe, on attempts at correlation of glacial drifts in the several fields, on the cause of loess deposition, on coincidence of present and preglacial sea level, and on low sea level during the Glacial Period with its effect on the Mediterranean and Straits of Gibraltar. The press work is good and the photographic illustrations excellent.

The author states in the preface that this volume was written because there is no general work in English to guide the geologist to the glacial literature and give him a grasp of the leading features of the subject. Yet no bibliography of the literature is appended and in only a few cases is full reference made to other writers. The author has seen, as yet, insufficient evidence in his study of the drifts

in the narrow field of the British Isles to convince him that there were distinct interglacial stages, and, unfortunately, he assumes that the evidence of such interglacial stages is inconclusive in any part of the world. In this and other matters he displays a distinctly sophomoric air. Thus on page 124 he announces:

"The elaborate systems of the older interglacialists may all be set aside as unproved. The class of evidence on which they were founded will not stand critical examination. For instance, the superposition of different sheets of till may at the most mean change in the direction of ice movement. The occurrence of interbedded gravels may merely mean local oscillations, or may be due to the natural formation of subglacial gravels between the ground moraine and englacial moraine. Fossiliferous beds between beds of boulder clay, unless they are clearly proved to be still in the position in which they were deposited, may have been caught up from the preglacial floor. The greater weathering of the older drift sheet may have been effected while the newer sheets were being deposited. It will thus be seen that it is a distinctly difficult thing to prove an interglacial period. We must, however, as Mr. Lamplugh has long maintained (Presidential Address to the Geological Section of the British Association, 1906), get back to solid ground in this matter before it is possible to make any real advance. There have been altogether too many speculations and too many loose correlations from place to place in dealing with this problem. We are bound to take our stand on the comparatively simple monoglacial hypothesis until we can prove at least one interglacial period. It will then be time enough to proceed to consider further possibilities."

That there are glacialists in the world who have been carefully considering all these matters in a long experience in field studies, and have been properly evaluating the field evidence, seems not to have dawned upon the author of this volume.

The contrasts in the amount of denudation displayed by the older and newer drifts of the British Isles is clearly set forth by the author, but he takes the position that these contrasts can not be used as a time measure because climatic conditions have not been uniform. It is probable, however, that in the British Isles, as in other glaciated districts, a careful study of drainage features would serve to make clear whether a given valley had been formed rapidly by a larger stream than the present drainage line, and especially if it was in use as a line of glacial drainage. The work of streams which headed in the ice sheet may thus be compared with that of contemporary streams which had no contributions from the ice. Comparison may also be made between the work along a given drainage line accomplished by glacial drainage, and that accomplished after the ice had ceased to contribute water to it. To set aside as of no value studies of weathering and erosion of drift sheets, as is done in the quotation given below, seems a departure from the spirit of true scientific investigation. The following statements appear on pages 75–76:

"The southern boulder clay plains are extensively dissected by a system of valleys which have for the most part come into existence since the abandonment of the district by the ice. These valleys frequently trench through into the underlying rocks, and the boulder clay thus comes to occupy the interstream areas. When, as for example in Nottinghamshire, the underlying rocks are exceedingly soft and denudation has been especially severe, more extensive removal of the surface has resulted in the drift only remaining as a capping to more or less isolated hills.

"This extensive denudation and maturity of drainage which characterizes the older drift is suggestive of a very considerable lapse of time since its exposure to subaerial erosion. Moreover, the denudation exhibited by the more northerly drift is trivial in comparison. We might draw from this the conclusion that the interval between the laying bare of the older and newer drift was immensely longer than post-glacial time were it not that we have to do with very different climatic conditions in the two periods. There is every reason to

believe that the climate of the districts fringing the ancient ice sheets was of exceptional severity, and that denudation must have proceeded with much greater vigor during the later stages of the Ice Age than under the more temperate conditions of the post-glacial period. It would, in fact, be a great mistake to accept denudation as a measure of time, when we are dealing with such variable relations of temperature and precipitation as appear to characterize the Quaternary.

"In the present state of our knowledge it is impossible to draw a definite line separating the older and newer drifts. Large areas can, however, be distinguished as belonging to one sheet or the other."

Notwithstanding these statements, a text figure is introduced on the same page (p. 76) outlining the probable limits of the glaciation represented by the newer drift of the British Isles. Also on pages 78–81 an interglacial shell-bearing clay at Kirmington, in North Lincolnshire, is discussed in detail and shown to be both overlain and underlain by boulder clay. There is no question that the stratigraphic relations are primary and undisturbed. The author, however, endeavors to guard the reader against making too much of this section, for he says, page 81:

"The extent of this 'interglacial' retreat need not have been very great and we have very little evidence as to its duration. That it was, however, something more than a mere oscillation of the retreating ice margin seems to be indicated by the marked difference in denudation exhibited by the older and newer drifts."

The author appears to have been sufficiently impressed by the work of Penck and Brückner in the Alps to accept their interpretation that there was a fourfold repetition of the foreland glaciation. He even goes so far as to present the diagram (Fig. 48) by Penck, representing the supposed relative length of the postglacial and interglacial stages. Concerning "Die Alpen im Eiszeitalter" by Penck and Brückner, he states that this marvelous work gives us a glimpse into what may possibly be effected when its exact method and acute reasoning come to be applied to other districts.

In the discussion of the glaciation of North America 15 pages are deemed sufficient to cover this most extensive of the fields of Pleistocene glaciation, in which the several drift sheets are more broadly exposed to view than in any other field, and in which the incisive methods instituted by Chamberlin have been actively carried on for over 30 years. No mention whatever is made of the oldest drift sheet, the pre-Kansan or Jerseyan, or of the mammalian remains found in the Aftonian beds which separate the pre-Kansan from the overlying Kansan drift, and which show clearly that conditions favorable for the existance of large herbivorous mammals prevailed. The Kansan, Illinoian and Iowan drift sheets are thrown together as "extramorainic," while the Wisconsin drift is classed as "intramorainic." The fact that the Illinoian drift is morainic at its border in southeastern Iowa and western Illinois, and that it embraces several recessional moraines, seems to have escaped his attention. The loess he makes use of to mark the separation between the "extramorainic" and the Wisconsin drift, the former drift being covered by loess, except a part of the Iowan, which he thinks should have been covered by it—in order, perhaps, to simplify matters for monoglacialistic interpretation.

The conclusion is drawn on page 167 that the whole American classification is ready to go to pieces because certain American glacialists have expressed doubt concerning the Iowan drift. The "agnosticism" which a few British glacialists have come to feel on the interglacial question is interpreted, without justification, to have pervaded the entire rank of glacialists in Europe in their attitude toward the northern drifts, the following statement being made on page 167:

"It is interesting to note that the apparent ease and definiteness with which the Americans have read the records of their glacial deposits is gradually becoming reduced to a state of agnosticism very similar to that of the European glacialists toward their northern drifts."

The supercritical spirit displayed in refer-

ence to the interpretations of interglacial stages both in Europe and America is laid aside when discussing the late glacial changes of level. In regard to these the author states that the Americans have carried out a series of researches on the shore lines around their lakes which rival in interest the magnificent results obtained by the Scandinavians. The author refers the uplift to the disappearance of the ice weight. He seems not to have reached the state of uncertainty on the question of the effect of the relief from ice weighting which certain Americans most closely connected with this investigation are experiencing.

The chapter on the Quaternary mammals is mainly descriptive, though they are listed as representing four classes, those characteristic of arctic tundras, of the steppes, of present-day southern distribution and extinct mammals.

The chapter on Quaternary man brings out the several stages of culture in accordance with the results of European investigations, and seems favorable to the correlation of certain stages of culture with late stages of the glacial epoch.

FRANK LEVERETT

ANN ARBOR, MICHIGAN

Biologie der Fische. VON DR. PHIL. OSKAR HAEMPEL, Privatdozent an der k. k. Hochschule fur Bodenkulture in Wien. Mit 55 Abbildungen im Text. Stuttgart, Verlag von Ferdinand Enke, 1912.

Attractively bound in true German style, this little volume appears as a separate from Dr. M. Hilzheimer's work on the "Biologie der Wirbeltiere." The author disclaims completeness, his object having been to put forth merely a guide or introduction to the biology of fishes. There is more information, however, than he would have one believe; much more, in fact, than can be found in any single American work on the subject.

The contents are grouped under three headings, namely: (1) A general review of the anatomy and physiology, (2) the dependence of fishes upon the chemico-physical conditions of habitat, (3) life manifestations of fishes with respect to other organisms.

The lateral line whose function is not well understood even at the present time has been studied and reported upon by at least one prominent American zoologist, but it has been considerably neglected by authors of general works. The adequate manner in which it is treated by the present writer is to be commended.

Literature concerning the food, feeding and digestion in fishes is widely scattered and in many cases unavailable to the student of animal ecology or of fish culture. Barring Dr. Forbes's admirable papers on the food of fishes, it can be said, also, that much of the published data are erroneous or at least that they give but a hazy notion of this important subject. Dr. Haempel here presents a full and most interesting account which evidently is the result of careful selection of those facts of practical importance.

The study of the breeding habits of fishes constitutes a large field of great diversity, one which has been surveyed but casually so far as American forms are concerned. And so, perhaps wisely, the author of the present work has confined his attention to the habits of European fresh-water forms and to the better known among marine fishes. His examples illustrating the various types of breeding are well chosen.

When one learns that the author was a former student of the well-known authority on fish diseases, Dr. Bruno Hofer, and in fact to whom this book is dedicated, it is a little surprising that this phase of fish biology is not treated more fully. The criticism may be favorable, however, in view of the fact that the work is designed merely as a guide.

It is unfortunate to find lancelets treated in a work on the biology of fishes, for they are not fishes and their inclusion necessitates many exceptions to the general statements.

The author is a teacher of fish culture as well as an ichthyologist and he has kept prominently before the reader the practical application of ichthyologic data. This is emphasized particularly in the sections dealing with

growth, development, physiology of respiration and digestion, his excellent summary of the principal investigations on the determination of age by means of the ootoliths, scales, opercular bones and vertebræ, and lastly, in a few pages relating directly to fish culture.

A summary of the important literature is given under each heading, emphasis being laid quite naturally upon European publications. This feature together with a full bibliography will be especially helpful to American students. The consideration of all recent experimentation and the judicious application of the principles set forth is a most commendable characteristic of the whole work.

G. C. Embody

The Care of Home Aquaria. By Raymond C. Osburn.

This contribution of Professor Osburn's, published by the New York Zoological Society as a volume of the New York Aquarium Nature Series, on account of its small size and necessarily popular character, is too likely to be overlooked. The investigator of any form of aquatic life will find aquaria of the utmost service, and will do well to refer to this simple presentation of the fundamental principles which govern their care. Under the captions The Meaning of Balance, Temperature, Placing and Cleaning the Aquarium, Animals that Will Live Well Together, Feeding, Marine Aquaria, The Care of Young Fishes, etc., a great deal of broad, practical information will be found arranged. Ample illustrations are attractive rather than instructive. A short appended bibliography will be found useful.

The following paragraphs are quoted more or less at random:

"The fact that animals require oxygen in respiration and that green plants give off oxygen in excess were discovered and published as early as 1778, but lovers of aquatic life were slow to apply this knowledge. In fact, it was not until 1850 that the first properly balanced aquarium was described by Mr. Robert Warrington of Manchester, England."

"To supplement the surface absorption of oxygen, it is necessary to grow plants in the aquarium."

"It is a common but very mistaken notion that an animal should have food at hand at all times to keep it in good condition. It is well known that various forms of domestic animals, as well as the wild species confined in zoological gardens, make the best growth and keep in the most satisfactory condition when supplied only with what food they will clean up at one feeding. This applies with equal force to the inhabitants of the aquarium, but besides *there is a real and grave danger of contaminating the water by supplying more food than will be readily consumed.*"

Emphasis is placed on the great educational value of aquaria. The ordinary balanced aquarium is a little world apart, in which plants, fishes and microorganisms are mutually interdependent, and the art of aquarium-culture is to understand and control this balance.

John Treadwell Nichols

Animal Flight, A Record of Observation. By E. H. Hankin. London, Iliffe and Sons, Ltd. 8vo. Pp. 413, 97 figures.

Considering the many explanations we have had of soaring flight, it is somewhat surprising that we know so little about it and that still further explanations seem necessary. The author of the book under consideration takes care to state in the preface that "the present book will be found to contain the facts in the case, with no explanation at all," a statement that seems at once to claim too much and too little.

Until he has watched and recorded the frigate bird and the albatross a large portion of the facts must be considered as lacking, while running through the record of the author's observations is an evident, though unexpressed, belief that some occult influence is at the bottom of it all.

The observations, for the most part, were made at Agra, India, and the majority of them on the kite, or cheel, *Milvus govinda,* though they include the adjutant and three species of vulture, all experts in soaring.

Special consideration is given to what the author terms the soarability of air, the condition that enables it to furnish energy for soaring flight, and the state of the weather as to sun, shade, wind, heat or cold are carefully recorded, as well as the time of day at which birds begin to soar. Soarability is believed to be brought about either by the sun or the wind, and sun soarability is stated to occur at a fairly definite time of day, varying naturally with the season. Here we are reminded of Mouillard's observations on griffon vultures in Algeria and his similar statement that they do not begin to sail until the sun is well above the horizon. The author seems inclined to have at first considered that there was a direct connection between heat eddies, indicating rising currents of air, and soarability, but later decided that this was not the case. And yet the curve showing time of appearance of heat eddies for a month coincides absolutely with the time of sun soarability.

Readers may recall, though Dr. Hankin does not mention it, the theory that soaring is effected by ascending currents of air impinging on the curved, though very minute, barbules of feathers. Wind soarability is believed to be due to some inherent property of the air and not to mere velocity, and throughout the book one notes the author's evident feeling that birds, flying fishes and dragon flies obtain energy from the air in some occult, or at least unknown way. Occult it does seem, to any one who has watched an albatross gliding into the eye of the wind or tacking back and forth, perfectly at ease in a driving gale. Wonderful it certainly is in view of the infinitesimal expenditure of muscular energy, but, remembering Langley's memoirs on the internal work of the wind and the strong and varied eddies that he showed might be present in an apparently steady breeze, one feels that birds with their thousands of years of experience and automatic adjustment to every air current can derive sailing energy from, to us, invisible sources.

Great attention is paid to the use of the wings and tail, and careful records are given of their varied motions, positions and relative angles to the body in directing, accelerating or checking flight; all of which are most valuable.

An extremely interesting chapter is devoted to the Flight of Flying Fishes, containing carefully-made and well-recorded observations of the character of their flight and the conditions under which it is made. The conclusion reached is the same as that of Colonel Durnford, that they do actually fly, and that initial impulse is utterly inadequate to account for the long distances covered, the sustained speed and ability to change direction when on the wing.

We are introduced to a considerable number of new words, or new meanings, such as soarability, flex-gliding, tail-jolting, and while at first sight these seemed unnecessary, yet on further perusal one was forced to admit that they conduced to brevity and clarity of statement. Lexicographers will find these new words and terms carefully defined in a glossary and will duly thank Dr. Hankin for his thoughtfulness and commend it to future coiners of words.

F. A. L.

RECENT STUDIES IN ANIMAL PIGMENTATION

MUCH has been written on animal pigmentation from both the biological and the chemical standpoint, but the views regarding the nature and origin of pigment are still at variance. Perhaps the chemists have made most progress in determining the chemical nature and composition of animal pigment, especially of that form known under the name of melanin, which occurs either normally or pathologically in the animal body, hair or feathers. Dr. Ross A. Gortner, of the Cold Spring Harbor Station for Experimental Evolution, who has devoted a number of years to this subject, states that the black humic substances, known as artificial melanin or "melanotic substances," resulting from the hydrolysis of proteins by strong mineral acids, or the dark products formed by the action of oxydases upon aromatic or heterocylic phenols may sometimes be shown to be related to the melanins, but until that relationship is demon-

strated, they should not be confused with the true animal pigment. He accepts the theory suggested by von Fürth, that all pigments are formed by the action of an oxidase of the tyrosinase group on an oxidizable chromogen, and demonstrates his claim by experiments with meal worm and the cicada.[1] In the former he finds that the normal coloration develops after the death of the larva, *i. e.*, after the secretion of the enzyme has ceased, while in the latter life is necessary to produce the normal coloration, although the enzyme once formed does not depend upon life processes. Accordingly, the rise of the true melanins is closely bound up with the enzymes and demands a biological investigation as well as a chemical, if such distinction is still justifiable in the light of modern chemico-physical interpretations of life phenomena.

During twenty years of experimentation I have found the oyster (*Ostræa Virginiana*) the most convenient and fruitful animal for the investigation of the nature and origin of pigments, because it can be easily handled and the conditions of light, temperature, food supply and pathological changes are readily controlled. My earlier experiments which were published from time to time in the *Proceedings of the Academy of Natural Sciences* of Philadelphia, 1893, in the *Bulletin of the University of Pennsylvania,* in the *Annals and Magazine of Natural History of London* and in the *American Journal of Physiology,* exclusively dealt with the influence of light on animal tissue under pathological conditions. My latest experiments, permitted through the courtesy of Dr. C. B. Davenport at the Cold Spring Harbor Experiment Station, took into consideration light, temperature, food supply and the absence of pathological influences. Several hundred oysters were opened without injury to the adductor muscle or any other part of the animal, except the shell, and placed on wire netting in a trough through which sea water flowed with varying degrees of velocity. Some of the oysters were placed within the fraction of an inch of the water surface, others at varying depths down to six inches or more from the surface. Enough of the left shell was removed to expose the greater part of the left mantle, the pericardium, the gills and the inner edge of the right mantle. The experiments were carried on from July 6 till August 15 at a time when the sun's rays are most effective and in a place exposed to the full sunlight during at least eight hours of the day. Eighty per cent. of all the oysters died after a few days of exposure; the remainder gradually darkened all over the exposed surface turning first light brown and finally jet black, while the removed shell was slowly regenerating along the broken margin. The temperature of the water varied on different days between 50 and 70 degrees Fahrenheit, with slight variations of several degrees between the various depths. There was also a difference in the quantity of the excreta, being enormously large in the oysters placed nearest the surface, showing a difference in the quantity of the food and in the oxydation process. The latter also blackened most rapidly, particularly along the gill bars and over the tentacles of the mantle. All the indications showed that the surviving oysters would fully regenerate their shells and continue to live as though nothing abnormal had occurred. In his experiments with the cicada Dr. Gortner found that the insect just emerged from the pupal shell and exposed to the action of the air rapidly turned black without regard to light, for several colorless adults which he exposed to strong light, dim light, total darkness and light which had passed through blue glass, showed no apparent difference in the rapidity of coloration nor in the final depth of color. Nor did Victor Faussek observe even a trace of additional pigmentation when he exposed oysters for many weeks to the direct rays of the sun or a diminution of the normal pigment when he placed them for several weeks in darkness. In all my experiments the phenomena of pigmentation and depigmenta-

[1] "Studies on Melanin," I., Method of Isolation, *Journal of Biol. Chem.*, 1910, II., The Pigmentation of the Periodical Cicada, *Journal of Biol. Chem.*, 1911, III., "The Inhibitory Action of Certain Phenolic Substances upon Tyrosinase," *Journal of Biol. Chem.*, 1911.

tion under the influence of light were very marked and never failed as long as the animals remained alive, while dead tissue generally disintegrates without change in pigmentation, due to bacterial fermentation. Gortner has proved that, in the case of the cicada, the oxidase is secreted together with the new cuticula, which ceases to be formed in the absence of life processes, for, when he washed and rubbed dead adults in a stream of water coloration took place only in spots, mostly in the folds of the abdomen, where the cuticula had not been completely removed, while other adults which had been as thoroughly washed but not killed, slowly darkened to the normal color. We may have a similar condition existing in the living oyster in which the regeneration of the shell, the homologue of the cuticula, takes place. In the case of the oyster, however, light must play the chief rôle, for when placed in darkness the depigmentation takes place in the epidermis of the oyster while the shell continues to grow, and, besides, pigmentation always takes place over the gills, the epidermal cells of which do not form a shell. Faussek's negative results with light can only be explained on the basis of the additional factor of temperature and perhaps of food conditions. If the oysters were placed so far below the surface of the water that the refraction caused a decomposition of the light and a consequent lowering of temperature or maximum energy and with it a diminution in the food supply the conditions for pigmentation became unfavorable and the results negative. On the other hand, Gortner's observations on the non-interference of light with process of pigmentation can be explained on the basis of the normal occurrence of maximum pigmentation in the cicada under any light condition as a hereditary factor, while in the oyster the epidermis of the mantle with the exception of the mantle edge is colorless when covered by the shell: the mantle edge is pigmented because it is generally free from the shell and exposed to light. In the one case contact with the atmosphere through the cuticula is essential, in the other light and temperature, for we find that oysters at certain depth or when covered with mud are lacking the pigment even in the mantle edge.

So much for the purely physico-chemical sources of pigmentation. Considering the biological side of pigmentation, a study of the structure of pigments and pigment cells is essential. There are different views on this subject. It is, however, generally agreed that pigments occur both as excretions and secretions either in a diffused or in a segregated form; in the one case they may be masses of colored granules represented by bilirubin, urochrome, melanin, etc., in the other they may be variously shaped cells, called chromatophores or melanoblasts. Keller distinguishes in the chamæleon melanophores, leucophores, ochropores, xanthophores and erythrophores, while Kromayer argues that pigment cells are not cells, but epithelial figures which, however, can not be isolated. Reinke again distinguishes between pigment carriers and pigment substance, the latter consisting of colorless prisms, scales, granules, etc. Ehrmann holds that "melanin is intra-cellular, and in the situations where it is present it occurs in the deeper layers of epidermal cells and in certain mesoblastic cells known as melanoblasts. The melanoblasts are specialized connective tissue cells which are round, spindle-shaped, or branching, and are peculiar not only for containing melanin granules, but also for having larger nuclei which stain more faintly than those of ordinary cells. Melanoblasts occur in the upper layers of the corium, are especially noticeable around the blood vessels and are also present as peculiar structures in the interepithelial lymph-spaces of deeper portions of the epidermis. The substance is a derivative of blood pigment, the material of which it is formed getting out of the blood vessels into the perivascular tissue spaces, where it is taken up by the melanoblasts and transformed into melanin. The epidermal cells do not elaborate melanin, but absorb it from the melanoblasts in the interepithelial lymphatics." The most recent views on the nature and origin of pigment in the sebaceous glands of certain Cavicornians have been advanced by Weber, Beccari and

Brinkmann.[2] Weber maintains that the black pigment granules of those organs are partly distributed like fine dust particles in the cells, partly united in small lumps, and the pigment is mixed with the secretion. He observed chromatophores which entwine the grandular acini, but emphasizes that the pigment is not derived from these acini, but from the sebaceous cells themselves. Beccari and Brinkmann, on the other hand, have more recently and independently of each other made the observation that the pigment is not formed in the glands themselves, but in the chromatophores mentioned by Weber and transported as finished products into the glands. Brinkmann describes the process as follows:

> The chromatophores, or more correctly the melanoblasts, as I call them, originate in the connective tissue, they are strongly anastomosing structures which, laden with melanin, migrate as far as the alveoli of the sebaceous glands. They are not only entwined by them, as Weber thinks, but the melanoblasts penetrate the connective tissue capsule of the gland and push themselves in between the cells of the gland. According to Beccari's investigations the amœboid process of the melanoblasts penetrate into the cells and deposit their pigment: this last phenomenon I could not confirm by direct observation, only the fact that they migrate into the cells.

Another noteworthy view that may be cited from the vast literature on the subject is that of Jarisch, who holds that there is a definite relation between the nuclear chromatin and pigment; certain chromatin particles, the tingible or pyrogenous bodies, are formed and changed into pigment balls. Luckjanow and Steinhaus have actually observed pigment masses arising around the nucleus in sarcoma and Maurer and Fraisse confirm this observation for the epithelial nucleus of *Pleurodeles* when it is the result of the degeneration of the nucleus being accompanied by the shrinking of the nucleus. This reminds us very vividly of Richard Hertwig's doctrine of the chromidial apparatus which involves the migration of chromatin particles from the nucleus into the cytoplasm. Goldschmidt very ingeniously enlarged this doctrine into the doctrine of the duality of the nucleus, according to which every animal cell is doubly nucleated, containing a somatic and a reproductive or genetic nucleus, the former performing the functions of metabolism and motion, the latter that of reproduction and transmission, the somatic nucleus representing Hertwig's chromidial apparatus. I mention all these recent views on the possible origin and nature of pigment formations, because they throw some light on my own observations. The histological knowledge of the mantle tissues of the oyster is still very inadequate, notwithstanding the classic investigations of Rawitz on "Der Mantelrand der Acephalen." We know in a general way that the epidermis consists largely of cylindrical cells, many of which are goblet cells filled with mucus; others are ciliated pigmented and nonpigmented cells, especially along the mantle edge. There are also numerous small mucous glands active in the formation and growth of the shell; a rich nerve plexus enervates the mantle edge and a large blood vessel with numerous blood lacunæ supplies the necessary food while a series of muscle bundles controls the contraction and expansion of the mantle. I made careful histological sections of the mantle of oysters not exposed to the direct rays of the sun, as well as of those that had been exposed various lengths of time. I also macerated blackened mantle tissue in the fresh state. In the unexposed specimens the pigment was confined to cylindrical cells along the mantle edge. The pigment granules were evenly distributed throughout the cytoplasm in most cases; in some there was a denser massing of granules along the outer margin of the cells, otherwise the mantle was free from pigment. Sections of the exposed mantle showed the presence of pigment granules in all the cells of the epidermis not only in the mantle but also in the gills and in the connective tissue cells of the pericardium. Macerated mantle

[2] N. Beccari, "Richerche intorno alle tasche ed ai corpi ghiandolari suborbitali in varie specie di Ruminanti," *Arch. ital. di Anatom e di Embriol.*, Vol. 9, 1910. A. Brinkmann, "Bidrag til Kimishaben om Drövtyggernes Hudkirtelorganer Vidensk. Medd. fra nath. Foren," Köbenhavn, 1911.

portions of specimens exposed more than four weeks to the direct rays of the sunlight proved most satisfactory. They exhibited all the stages of pigment formation suggested by the various theories, epidermal cells in which the pigment was densest around the nucleus with the nucleus in a shrinking condition, confirming the theory of Jarisch and others; further intercellular pigment masses with amœboid processes situated between mucous cells and glands similar to the melanoblasts observed by Becarri and Brinkmann. Also pigmented masses along the blood vessels of the gills undoubtedly stimulated by the respiratory changes in the circulation of the blood, but the largest pigment mass consisted of innumerable spherical bodies of accumulated melanin granules which covered the epidermis of the mantle and were held by a layer of mucus exuded from the cells and forming the ultimate fate of the pigmentation process. In specimens that had been returned to the dark after several weeks most of the pigment had disappeared, and where present was confined to the original pigment cells of the epidermis, largely along the mantle edge, with scattered disintegration products of pigment granules throughout the epidermis.

Though the work is still tentative, I have come to the conclusion that animal pigmentation is probably a protein formation due to an enzyme which is circulating in the blood and present in the nucleoplasm of all secreting cells. This, of course, could only be proved by chemical analysis. In some cases the leucocytes are transformed into specific chromatophores or melanoblasts, capable of amœboid motion; in others the deposition of pigment has become a hereditary factor, as, *e. g.*, in the choroid coat of the eye or the ink-bag of the squid; in still other cases pigmentation is stimulated into action by internal metabolic processes as well as by external conditions of light, temperature and atmospheric gases. In the case of the oyster light is the chief factor in the stimulation of pigment, which is the result of protective reaction against abnormal conditions. But this reaction is in my judgment not merely chemical, it is preeminently biological and under the control of nuclear determinants.

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SPECIAL ARTICLES

SUPPRESSION AND LOSS OF CHARACTERS IN SUNFLOWERS

Helianthus and *Œnothera* are very little related, yet in breeding and studying sunflowers one is constantly reminded of phenomena previously recorded in connection with evening primroses. The parallelism in variation is such that one is led to ask, what, precisely, do we mean by a "new" variation? A "new variety" can be easily defined as a distinguishable type arising in a species, and either "new" in the sense of being newly discovered, or (as we believe to have been true of the red sunflower) actually originating within the period of our knowledge. We have thought it highly satisfactory to be able to list[1] instances of newly occurring varieties or mutations, with some suggestions regarding their proximate causes, but it must not be forgotten that in so doing we have gone only a little way below the surface. If many plants, of widely different families, produce entirely analogous variations, it must be true that there is something in the constitution of the whole series which makes the apparent accidents inevitable. One is reminded of the occasion when Whistler made an exceptionally good joke, and Oscar Wilde, who was present, remarked, "I wish I had made that joke!" Whistler replied, "My dear fellow, don't worry, *you will make it.*" So might the *Gaillardia* have said to the sunflower, five years ago, though without the sarcastic intent.

The commonest of all variations results from the loss of a character, but this may be due to latency, or to the dropping out of a determiner. In sunflowers, the "primrose" varieties, with pale primrose-colored rays, offer a typical case; another, of which a single example occurred in

[1] Gates, *Quart. Jour. Micr. Science*, Feb., 1914, pp. 562–563, gives an excellent tabulation of the principal types of mutation.

our cultures, is without rays. Both variations are fairly common among the Compositæ, and the characters may become specific, as in the rayless species *Gaillardia suavis;* or even generic, as in *Hymenopappus,* which has no rays.[2] Messrs. Sutton & Sons, of Reading, England, inform me that they introduced the primrose-rayed variety of the common sunflower in 1889; it had occurred as a sport from the ordinary form a few seasons before. We have shown by breeding that it is recessive to the orange-rayed (normal) form, and segregates in a normal Mendelian manner. On August 19, 1913, my wife and I found near Goodview, Colorado, a lot of wild sunflowers (*H. annuus* subsp. *lenticularis*) growing in very dry ground by the roadside, and consequently very small. In the midst of the normally colored plants was a single example of a primrose-rayed variety,[3] which I dug up with great difficulty, owing to the very hard dry soil, and removed to the garden, to be used in crosses. Here, in this poor little starved plant, we had what might have been the origin of a whole series of primrose-rayed varieties, greatly adding to the beauty and interest of gardens, had not Sutton obtained an analogous form years before. As it is, we hoped to see some interesting modifications through the introduction of the wild strain into the cultivated group.

On the same day that we found the wild *primulinus,* we also found a form[4] of *H. aridus* Rydberg with lemon-yellow rays, a shade intermediate between orange and primrose. This *H. aridus* is treated by Nelson as a synonym of *H. petiolaris,* but this is certainly an error. Its characters strongly suggest that it is a *lenticularis* × *petiolaris* hybrid. It is not merely *lenticularis* growing in dry ground, for that plant in the driest places does not become *aridus.*

In the cases just cited, we seem to be concerned with the dropping out of a determiner, but we have other examples which will not bear this interpretation. Repeated experience in breeding has shown that the *coronatus* character (red on the rays) is a typical Mendelian dominant, but its *expression* is very variable. We noted in the case of the original plant, that the last small heads of the season were almost entirely yellow rayed. We have also observed that heterozygous plants may have very richly colored rays. Mr. Tufnail, of the

[2] *Leucampyx newberryi* Gray and *Hymenopappus radiatus* Rose are rayed *Hymenopappus,* though the *Leucampyx* retains the primitive character of disc-bracts, while otherwise almost identical with *H. radiatus.* Nelson states that *Leucampyx* has no pappus, but this is an error; it has pappus-scales like those of *Hymenopappus.*

[3] *Helianthus lenticularis* var. *primulinus,* nov. Rays primrose color; disc-corollas very pale yellowish-green or greenish-yellow, the lobes faintly tipped with reddish; disc-bracts dark at end; stigmatic branches pink, dark at end, the general effect to the naked eye pale lavender. Leaves very broad, thick, hoary. In the garden variety (*annuus* var. *primulinus*), the plant compared being one extracted in the F_2 from *primulinus* × *coronatus,* we find the stigmatic branches almost black, while the lobes of the disc-corollas have the apical part, and the margins below that, dark lake; even the pappus scales are deep lake. Hence the general effect of the disc is very black, very different from the normal form. We have obtained, however, another garden variety (*H. annuus* var. *selene,* nov.) with the disc pale greenish yellow; rays light primrose; stigmatic branches pale primrose. The plant is about 5 feet high; stem without purple; leaves large; involucral bracts long-pointed, lateral cilia short and not conspicuous.

[4] *Helianthus aridus* var. *citrinus,* nov. Rays lemon yellow. It does not follow, because there are at least three degrees of yellowness (corresponding approximately to Ridgway's cadmium yellow, lemon chrome and picric yellow) in sunflower rays, that there are three kinds of pigment. Rays of *H. annuus* var. *primulinus,* which are picric yellow, on drying for the herbarium turn brilliant light lemon yellow. Examining rays of garden sunflowers under the microscope, it is seen that in the normal (cadmium yellow) and lemon (lemon chrome) forms the pigment nearly fills the cells, and is differently colored in the two. In the primrose variety, however, the pigment is *much less abundant,* as well as paler. It is perhaps probable that the pigment of the primrose variety is quite the same as that of the lemon one, appearing paler only because not massed; there are then two types with regard to its density or abundance, the combinations of these producing three varieties.

Sutton firm, tells me that in England the amount of red shown by the plants differs greatly according to the soil. Even in the same head, however, we may find remarkable extremes. Sometimes the orange rays are irregularly flecked with red, as if some one had been painting near by, and had accidentally touched them here and there. One plant (F_2 from *cornatus* × *primulinus*) had orange rays, the basal half strongly suffused with red; disc before flowering pale yellow (due to color of disc-bracts), except a small triangular section of rather light purple, its apex not quite reaching the center of the disc. A still more singular head (*coronatus* × *annuus*), with a dark disc 44 mm. in diam., and rays 50 mm. long, had the 27 rays variously colored, in order, as follows: (R = deep chestnut red, rather streaky, on basal half or more; Y = orange-yellow, with practically no red; M = medium, between these extremes). Y R R R M M M Y Y Y R R Y Y Y Y R R R R R M Y Y Y Y. Are we to suppose that in these cases irregularities have arisen in the course of the somatic cell-divisions, the whole plant being in an unstable condition as regards the factor for red? Could cytological studies throw any light on this?

A certain analogy may perhaps be found in the occurrence of fasciation in our *lenticularis caronatus* × *annuus* plants. A very fasciated plant, crossed with presumably normal ones through the agency of the bees, gave seven F_1 plants, of which two showed fasciated heads, but others exhibited variously split and divided rays. Here it seemed that a weakness existed, but in some cases only found expression in the most peripheral parts, and to a relatively slight degree. Another set of plants with a fasciated parent showed what looked like supernumerary rays, but they were actually extra elongated lobes borne on the ray florets.

Davis and Salmon[5] have described etiolated or sterile dwarfs which arose in *Œnothera* and *Humulus*. We have obtained the same thing in sunflowers, from heterozygous *coronatus*. A family of thirteen plants had the third, fifth, seventh, ninth, eleventh, twelfth and thirteenth dwarf and mostly etiolated. With the best care we could give them, all died but two, though the normal members of the series, growing in the same row, showed no evidence of adverse conditions. The two survivors (Nos. 12 and 13) finally flowered at a height of 30 and 27 inches, respectively;[6] one (12) had the disc orange; the rays, bright lemon suffused with orange, long and slender, curled. The other (13) had the disc dark; the rays very short, suffused with red at base. No. 12 produced much pollen; but 13 had the anthers all aborted, shrivelled up within the corolla tube, producing only a very little pollen, presumably not viable. The pistils of 13 were fully exserted and normal, but nothing could be seen of anthers or pollen except on dissection.

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[5] B. M. Davis, *American Naturalist*, Aug., 1913, p. 453 et seq. E. S. Salmon, *Jour. of Genetics*, February, 1914, p. 195.

[6] Certain species of perennial sunflowers (*H. filiformis, ciliaris* and *cinereus*) are normally as small as this.

SOCIETIES AND ACADEMIES

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

AT a special meeting of the society held March 24 at the National Museum, Dr. Albert Hale, of the Pan-American Union, addressed the society on "Modern Argentina," illustrating his remarks with lantern slides. The ethnical elements of Argentina may be best studied in immigration statistics. Of the total number of immigrants arriving in 1857–1912, 4,248,355, more than one half, or 2,133,508, were Italians. The Spaniards numbered scarcely more than half as many as the Italians, or about 1,298,122. Other European races were represented by much smaller numbers than these. The French numbered only 206,912 and the Russians, 136,659. Next to these came the Syrians, of western Asia, with 109,234; then the Austrians and Germans, with 80,736 and 55,068, respectively. The Britons numbered nearly as many as the Germans, or 51,660. The Swiss, Belgians and Portuguese, numbered about 20,000 or 30,000 each; the Danes and Dutch, 7,000 each; the North Americans, 5,500; the Swedes, 1,700, and others 79,251. The relative proportions of Italians and Spaniards arriving during 1912 were the same

as during the entire period, but the Russians and Syrians rose to the next two places in the list.

At a special meeting of the society held April 7, at the National Museum, Señor F. A. Pezet, Minister of Peru, read a paper on "Contrasts in the Development of Nationality in Latin and Anglo-America." These flow from differences in character, born with the individual or developed through the environment. The Anglo-Americans had been persecuted by religious intolerance; the Latin Americans were adventurous soldiers of fortune. The mixing of the Latin and Indian races was encouraged. The offspring became the "Mestizos." Later the Creoles came into existence, the offspring of European parents born in America. Before 1800 A.D. the Mestizo population of Peru exceeded 250,000. There is now in Peru a large percentage of pure Indian and of Mestizo blood. For more than two centuries the Europeans and the Creoles ruled the Mestizos and the Indians. The Mestizo is nearer the Caucasian than the Indian; physically and morally he is superior to the Indian. Although of less active intelligence than the European or the Creole, he is more strong-willed and painstaking. The Mestizos were prevented from obtaining social position and education.

At a special meeting of the society held April 14, Mr. S. M. Gronberger read a paper on "The Origin of the Goths." The ancient home of the Goths was undoubtedly situated, he said, on both the northern and southern shores of the Baltic. About 300–200 B.C. another division of this race immigrated into the Scandinavian peninsula, probably across the Danish isles. At the time of the earliest Gothic movement southward, about 215 A.D., the immigrants were probably joined by their Scandinavian brethren, who emigrated from "Scandza." Names of regions and localities in Scandinavia testify to their association with the Goths, the Ostrogoths and the Visigoths. The two races are now merged together and constitute the modern Swedish nation. The Anglo-Saxon poem "Beowulf," furnishes powerful testimony as to the early home of the Goths in Scandinavia and the Danish isles. The Baltic island of Gotland received its name from the Goths, and great numbers of Roman and Byzantine coins and other objects which have been unearthed there afford further proof. Jordanes, Cresiodorus, Tacitus, Procopius and Paulus Diaconus, not to mention the earliest though doubtful evidence of Pytheas of Marseilles, and many other Greek and Roman historians, testify to the Scandinavian or Baltic origin of the Goths. The most ancient tradition relating to the Goths was that they had come originally from Asia. One of the most remarkable runic inscriptions in Scandinavia is that of the so-called Rök Stone, discovered in western Ostrogothia, Sweden. It dates back to 830–840 A.D., or the time of the introduction of Christianity into Scandinavia, and contains an allusion to Theodoric the Great, who afterward ruled as king of Italy. It also refers to four kings of the Danish island of Zealand whose names can be identified with the names mentioned in Jordanes's saga.

The evidence of relationship between the Gothic and the modern Scandinavian and Germanic tongues is also of great importance. The most essential point of resemblance between these languages is the mutual retention in certain cases of "gg" before "w" and "j," as in the genitive plural old English "tweza" (two), Danish "twaeggie," Gothic "twaddje," modern Swedish "twegge."

At the 474th regular and 35th annual meeting of the society, held May 5, at the National Museum, Dr. Edgar J. Banks, field director of an expedition to Babylonia, read a paper, illustrated with lantern slides, on "Bismya; or, the Lost City of Adab." Bismya flourished in central Babylonia from 4,000 to 2,000 B.C. Inscriptions were found of Dungi, king of Ur, of about 2,200 B.C., and of Naram-Sin and Sargon, the first known Semitic kings, of about 2,800 B.C. Lower were traces of the earlier civilization of the Sumerians, a cultured people who had occupied Mesopotamia for several thousand years. An important discovery was a large marble statue of a Sumerian king called Lugal Da-udu of about 4,000 B.C. Large numbers of stone vase fragments were here found, some inscribed with the names of the kings of the fifth millenium before Christ. The lowest pottery fragments showed that perhaps 15,000 years ago a people with considerable civilization occupied that spot. An ancient Sumerian crematory was found. The Semitic dead were buried. Many collections of clay tablets were found which contained the business documents of Bismya. This people was among the oldest which had a highly developed civilization.

The following officers of the society were elected: *President*, Mr. James Mooney; *Vice-president*, Dr. John R. Swanton; *Secretary*, Dr. Daniel Folkmar; *Treasurer*, Mr. J. N. B. Hewitt; *Councilors*, Mr. Felix Neumann, Dr. I. M. Casanowicz and Mr. Francis LaFlesche.

Daniel Folkmar,
Secretary